

UNIVERSITY OF CALIFORNIA
SANTA CRUZ

**WILDLIFE TRAFFICKING IN THE RUSSIAN FAR EAST: A
CRIMINOLOGICAL INQUIRY INTO THE ORGANIZATION OF THE
ILLEGAL TIGER TRADE**

A dissertation submitted in partial satisfaction
of the requirements for the degree of

DOCTOR OF PHILOSOPHY

in

ENVIRONMENTAL STUDIES

by

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June 2021

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ABSTRACT

WILDLIFE TRAFFICKING IN THE RUSSIAN FAR EAST: A CRIMINOLOGICAL INQUIRY INTO THE ORGANIZATION OF THE ILLEGAL TIGER TRADE

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Globally, the illegal wildlife trade's reach is increasingly omnipresent and now constitutes the greatest threat to the survival of many species. Tigers are one of the most exploited wildlife species, due in large part to the enduring domestic demand for traditional medicine in Asian countries, especially China. The past 100 years has seen the global tiger population shrink from 100,000 to less than 3,500 individuals. In the Russian Far East poaching has been identified as the most direct threat to the Amur subspecies however, almost no empirical evidence exists about the true extent of the poaching crisis. By utilizing criminological ethnographic methodology, I conducted semi-structured interviews and participant observation with those directly involved – the poachers, buyers, middlemen and smugglers – in tiger poaching to gain insider information about this wildlife crime. After spending five months in Russia over the course of two years I interviewed 116 respondents, 43 (37%) of which admitted direct involvement in poaching and/or trafficking of tigers. The information I gathered help me identify who is involved in poaching and trafficking

Amur tigers, their primary motivations and *modus operandi*, smuggling methods/routes to China, the number of tigers poached in the region per year, and detailed information about the corrupt practices that facilitate its occurrence. I hope this data, the first empirical evidence about the Amur tiger poaching crisis, will inform the conservation community about what is really happening in the Russian Far East, lead to more accountability from the Russian and Chinese governments, provide tangible and context-specific conservation solutions based on the robustness of criminological theory and methods, and facilitate demand reduction campaigns to end the illegal wildlife trade.

ACKNOWLEDGEMENTS

The experience of earning this PhD has consisted of some of the highest and lowest points of my life. It has built me up, broken me down, and profoundly changed me as a person. I have a motto, “Anything for the tigers”, which was challenged on numerous occasions during this process, especially the final year. However, the same blind, excessive passion that has driven me my entire life compelled me across the finish line. In the end I regret nothing, except that this research was even necessary.

This dissertation would not have been possible without the mentorship of my advisor, Brent Haddad. Without having any knowledge about tigers, poaching, or the illegal wildlife trade, he stepped in without a second thought at a time when I needed support the most. My gratitude for his guidance and support cannot be expressed enough. I also want to thank my other committee members, Andrew Lemieux, who helped shaped my knowledge and ideas about criminology, and Bernie Tershy, who stepped in quite literally at the 12th hour.

For my family – Kip, Illa, Kelsey, and Erica – who cannot begin to conceive what I have actually been doing all these years but have been nonetheless eternally supportive throughout the process. I had to rely even more on this support system this past year, and I do not think I would have managed to finish this dissertation without them. For Jack, Lyla, Charlotte, and Everly, who inspire me every day to ensure the survival of our planet’s wildlife. I hope to continue to show them that we are merely stewards of this planet, it is our greatest inheritance, and how we treat it will echo for

generations to come. I want to thank Beau, who I met at a rather tumultuous time in my life, for his patience, love, and support. He is proof that everything happens for a reason. And finally, for all wildlife, everywhere. Thank you for the inspiration and giving me my life's purpose. I hope one day humans will appreciate you more than we have shown. May there always be tigers in the wild.

Introduction

Wildlife crime, defined as the poaching of and the illegal trade in wildlife, (Moreto and Pires 2018) constitutes the greatest threat to the continued existence of many species. Wild animals are poached and trafficked for a variety of reasons –food, clothing, cultural/traditional practices, medicinal uses, decorative items, and as live pets. The illegal wildlife trade is characterized by its complexity and contextuality; it can manifest in many forms and exhibit links to a variety of markets each with their own distinct drivers, actors, supply chains and modus operandi (Pires et al. 2016; Van Uhm and Siegel 2016). Globally, the illegal wildlife trade is becoming ubiquitous, driven by the low risk, high reward nature of the activities (Viollaz et al. 2018; Warchol and Harrington 2016) coupled with globalization, which eases the challenge of international communications, coordination, and delivery, and persistent demand, particularly from Asian countries (Wyatt et al. 2018).

Tigers (*panthera tigris*) are significantly threatened by the illegal wildlife trade. The last century has marked the precipitous decline of the global tiger population, down from 100,000 tigers to a current population of around 3,500 individuals (Goodrich et al. 2015). Between 2006 and 2014 there was a 42% decline in their range, a constriction that has left the species occupying only 6% of their historic range (Goodrich et al. 2015). Despite their charismatic appeal, CITES protected status, and unprecedented international funding appropriated for their

conservation (estimated to be \$100 million annually) (Moyle 2009), wild tiger numbers have continued to decline dramatically.

Six of nine subspecies are extant: the Bengal, Amur (Siberian), Indo Chinese, South China (extinct in the wild), Malayan and Sumatran. The 13 recognized tiger range countries are across Asia, a densely populated and rapidly developing region where many factors have fundamentally affected the ability of tigers to persist (Goodrich et al. 2015). Tigers require large swaths of natural forested habitat and within most parts of Asia the conversion of suitable habitat to agriculture, logging, and human settlements has risen significantly. Consequently, tiger populations are increasingly at risk from habitat loss and fragmentation, declines within their ungulate prey base, and an increase in human/tiger conflict (Abbott and van Kooten 2011). Additionally, tigers continue to be susceptible to extreme poaching pressure, predominantly due to the enduring domestic demand for traditional medicine in Asian countries, especially China (Moyle 2009; Wong 2016). The tiger trade has been banned in China since 1993, however despite the illegality and decline of wild populations, the demand for tiger parts and derivatives, including bones, claws, canines, pelts, meat, whiskers, and penises, has continued unabated. Poaching pressure remains high and the most immediate threat to the species' survival.

The Russian Far East (RFE) is the last stronghold of the Amur subspecies, with a population estimated to be about 300 adults (Wildlife Conservation Society). The Amur population is critically important for the species' overall survival, as it is the only subspecies with a wilderness range that is generally ecologically intact and

has one of the lowest human population densities in the world, therefore population expansion is possible (Kostyria et al. 2018). Filling in the knowledge gaps about tiger poaching in this region is critical and time sensitive. Poaching has been identified as the most direct threat to the Amur subspecies (Robinson et al. 2015), however only anecdotal information exists about who is involved, their motivations and *modus operandi*, and the structure of the supply chain.

The study of wildlife crime falls between two disciplines: criminology and conservation science. Criminology has historically been focused on traditional street crimes (e.g., robbery and burglary). The exploitation of natural resources and wildlife has not been addressed in orthodox criminal law; therefore, scholars of criminology are only recently joining the discussions about wildlife crime (Lynch et al. 2017). Those within the conservation sciences have been engaged with questions concerning the preservation of biological diversity and endangered species, consequently, studies on the illegal wildlife trade have largely been within the fields of conservation biology and ecology (Drury et al. 2011). However, by focusing on natural science theory and methods, the human dimension of wildlife crime has largely been ignored, and therefore policy solutions have remained largely truncated and cyclical. By cohesively merging conservation science and criminology, the study of wildlife crime approaches and analyzes conservation issues as problems that are inexorably embedded in human and social systems, as such, conservation is as much about biology and ecology as it is about changing human behavior (Balmford and Cowling, 2006; Schultz, 2011).

By merging these two disciplines into a wildlife crime framework, I utilized an ethnographic case study approach to collect data for this dissertation, and my goal was to conduct qualitative conservation science research from a criminological perspective. I sought primary data from the first-hand accounts of the individuals who are directly involved in the illegal tiger trade – the poachers, middlemen, buyers, and smugglers. I interviewed a total of 116 participants over the course of five months in the field spanning two separate trips to the RFE. The chapters that follow are the first empirical research conducted to reveal the hidden and corrupt world of tiger poaching and trafficking in the RFE.

The first chapter, “Uncovering the nuances of criminal motivations and modus operandi in the Russian Far East: a wildlife crime case study”, is a detailed description of the methodology utilized for this study. This methods chapter acknowledges that while there has been a recent increase in criminological attention to conservation science scholarship (see, e.g., South and Wyatt 2011; Lemieux 2014; Moreto and Lemieux, 2015a, 2015b; Van Uhm 2016; Wong 2016; Sollund and Runhovde 2020), approaching wildlife crime via a criminological lens remains rare. By recognizing the importance of furthering the development of wildlife crime research methods, I discuss how criminological ethnography can advance understanding in human behavior in conservation contexts and provide an important complement to natural science and specifically, wildlife crime research.

The second chapter, “Amur tiger poaching in the Russian Far East: motivations fostering a poaching subculture”, acknowledges that although the

primary destination for tiger parts is across the border in China, even sophisticated transborder wildlife supply chains begin at the local level. Considering that, the focus in this chapter is on determining the specific drivers of poaching behavior in the RFE. Who is involved? What are their motivations for poaching? Beginning with a discussion on the motivations for poaching found in the literature, this chapter then focuses on exploring the complex array of poaching behavior and motivations found in the RFE.

The third chapter transitions from criminal motivation to criminal intention and action. Titled, “Using crime script analysis to elucidate the details of Amur tiger poaching in the Russian Far East,” this chapter uses crime script analysis to break down the event of poaching into a process of sequential acts. Script analysis offers a tool to assist with understanding criminal *modus operandi* by highlighting how opportunity and the characteristics of the immediate environment facilitate a crime (Cornish 1994). By directly interviewing those involved, I was able to gain insight into the intricate details and nuances of criminal *modus operandi* of those engaged in the poaching and trafficking of tigers from the viewpoint of the offenders themselves. This information is used to build a crime script by breaking down the poaching event into distinct steps that cumulatively facilitate the opportunity to poach. Based on the 25 techniques of situational crime prevention, I am then able to identify pinch points or weak links in the chain of actions to recommend context-specific intervention strategies.

The fourth chapter titled “Demographic modeling to inform population stability: A case study to predict extinction risk of Amur tigers based on poaching offtake rate in the Russian Far East”, is a quantitative shift to assessing the impact of poaching on the Amur tiger population. This chapter explores how demographic modeling can be used as a tool to quantify how poaching is impacting the overall persistence of the Amur population. Given how poaching is a threat to tigers in the RFE and the goal is to model the rate of poaching to predict extinction risk, the type of data that would be needed and the best fit model based on that data is discussed – determining that an individually based stochastic spatial model would be the best choice. The presence of an extensive roading network in the RFE, primarily build for illegal logging purposes, and how this directly translates into increasing access for potential tiger poachers, is also discussed.

Chapter 1

Uncovering the nuances of criminal motivations and *modus operandi* in the Russian Far East: a wildlife crime case study

Abstract

Wildlife crime is a relatively new line of inquiry for scholars of criminology; traditionally it has been the purview of conservation science. However, as conservation is fundamentally about changing human behavior, the value of a criminological perspective to understand both the theoretical underpinnings of wildlife crime commission and practical mitigation strategies is being increasingly recognized. Based on an ethnographic case study on the poaching and trafficking of Amur tigers in the Russian Far East, this paper reflects upon the use of criminological ethnographic methods to understand the complexity and subtleties of wildlife crime by directly interviewing the poachers, middlemen, buyers, and smugglers involved. The article seeks transparency on how qualitative methods can be successfully employed to engage in fieldwork with active criminals in peripheral settings.

Introduction

Wildlife crime, defined as the poaching of and the illegal trade in wildlife¹, (Moreto and Pires 2018) is becoming increasingly ubiquitous and constitutes the greatest threat to the continued existence of many species. The empirical study of wildlife crime falls between two disciplines: criminology and conservation science. Criminology, a field within both the behavioral and social sciences, has a well establish interdisciplinary scholarship. However, traditionally it has focused on the study of conventional street crimes (e.g., robbery and burglary); the exploitation of wildlife has rarely been addressed in orthodox criminal law and therefore remains a subject that has received limited attention from scholars of criminology (Gore 2011; Pires and Clarke 2012; Van Uhm and Siegel 2016; Lynch et al. 2017).

Conservation science falls within the purview of conservation biologists and ecologists (Drury et al. 2011), situating wildlife crime research in the realm of the natural sciences. Consequently, within conservation biology, a focus on numerical quantification favored by the natural sciences has occurred at the expense of a criminological perspective. While there has been a recent increase in criminological attention to conservation science (see, e.g., South and Wyatt 2011; Lemieux 2014; Moreto and Lemieux 2015a, 2015b; Van Uhm 2016; Wong 2016; Sollund and

¹ Scholars have defined wildlife crime in a variety of ways. Besides the definition used in this paper others include 'any harm to (or intent to harm or subsequent trade of) non-domesticated wild animals, plants and fungi, in contravention of national and international laws and conventions' (Sollund and Runhovde, 2020; Harrison et al., 2015). Wyatt (2013) and Nurse and Wyatt (2020) use a green criminological framework to expand the definition of wildlife crime to include harm that is legal but causes suffering and/or injury to wildlife, thus arguing that defining crime in a way that only includes actions prohibited by criminal statutes and laws is too limited in scope.

Runhovde 2020), it is necessary for criminology's contribution to conservation scholarship to continue to develop, as it still has much to contribute to theory building, methodological breath, and policy application in our understanding of the human dimension of wildlife crime.

Quantitative data analysis employs techniques and perspectives such as modeling, to minimize error variance, while qualitative data provides opportunities to understand and explain the nature, underlying characteristics, and meaning behind the observed variability (Rust et al. 2017). Moreto (2016) contends that wildlife crime studies have traditionally favored quantitative over qualitative methods due to scholars within conservation lacking awareness on the theories and methods utilized by social scientists. This preference fails to account for the complex interface between human-natural systems – the sociocultural and political processes alongside the ecological considerations – highlighting a common dilemma in conservation-related problems, where challenges may well be biological in nature, but many influencing variables are rooted in the human, social world. Natural science problems are embedded in human and social systems, as such, conservation is both about biology as well as about *changing* human behavior (Balmford and Cowling 2006; Schultz 2011).

Scholars of green criminology were instrumental in expanding the traditional concept of crime by bringing attention to the many destructive and often marginalized forms of environmental crimes (Lynch et al. 2017). More recently, wildlife crimes, including the illegal wildlife trade and its associated correlates, causes, and links to

globalization and capitalism, have become significant green criminology concerns (Goyes and Sollund 2016). However, these issues have generally been explored quantitatively (Lynch 2019). Qualitative methods can infuse conservation-oriented research topics with the necessary context needed to fully appreciate and understand the complexity between the natural and social world that may otherwise be overlooked through quantitative methods (Drury et al. 2011).

Recently, there has been an increase in the use of qualitative methods to explore wildlife crimes. Qualitative methods have been used successfully to interview those directly involved in the illegal markets of parrots in the neotropics (Pires et al. 2016), black caviar in Russia (Van Uhm and Siegel 2016), tigers in China (Moyle 2009; Wong 2016; Van Uhm and Wong 2019), and live wildlife trade in Peru (Leberatto 2016). Scholars have also employed other techniques to acquire related wildlife crime data, for example, interviewing NGO leaders, government officials, and scholars (e.g., Wyatt 2009, 2011; Arroyo-Quiroz and Wyatt 2019), law enforcement personnel (e.g., Runhovde 2015, 2017, 2018; Warchol and Harrington 2016; Moreto and Lemieux 2015a; Moreto 2016), and a combination of environmental experts/authorities and law enforcement agents (e.g., Sollund and Runhovde, 2020; Sollund, 2017).

This paper further builds on this literature and discusses how qualitative methods can be utilized in the field of wildlife criminology, based on my ethnographic field work in the Russian Far East (RFE) (Figure 1.1). My research on Amur tiger poaching and trafficking in the RFE, sought to expose details about an

enduring wildlife crime problem in a politically, socially, and culturally complex region. My chosen methodology and subsequent methods were focused on adequately exploring the interdisciplinary nature of wildlife crime. My decision to pursue a criminological ethnographic study was necessitated by wildlife poaching and trafficking's deep interconnections to culture and society and ethnography's ability to capture the intimate and immediate sociocultural aspects of crime and the contextual logic and emotion that define criminal experience (Katz 1988; Ferrell 1999, 2006). Long-term solutions to wildlife poaching and trafficking must successfully connect to a region's culture and society, requiring a knowledge of the local experience.

This research was influenced by cultural criminology, where crime is explored and understood in the context of culture in late modernity through the eyes of the offender (Ferrell et al. 2008; Hayward and Young 2012). Inspired by sociology and focused on the *individuals* involved in crime and deviance (Becker 1963), cultural criminology's associated qualitative methods emphasize ethnographic models for direct, naturalistic inquiry (Adler 1985; Ferrell 1997; Ferrell et al. 2008). I also drew from green criminology, which focuses on extending the scope of conventional criminology to include acts that cause ecological damage, regardless if they are recognized in traditional law; the central question transitioning from not whether an act is or is not punishable, but whether it is harmful (Wyatt 2013; White 2008). By acknowledging the influence of these two theoretical perspectives on my study, this work may contribute to the dialog taking place in green cultural criminology, a relatively new approach, which seeks to integrate the array of perspectives that have

influenced both cultural and green criminology (Brisman 2017). Within this framework one of the goals of criminologists is to acknowledge and address the connections and overlap between theoretical positions, of which there are many between cultural and green criminology – particularly the cultural dimension of environmental harm (Brisman and South 2013, 2014). This work recognizes the underlying socio-political, economic, and cultural factors associated with environmental crimes and harms and can contribute to the green cultural criminology perspective by critically evaluating the intersection of the environment, culture, crime, and justice along with forms of resistance that challenge the modern foundations of society and forms of social control responsible for environmental harm (Brisman and South 2013).

In the RFE, poaching has been identified as the most direct threat to the Amur tiger subspecies (Robinson et al. 2015), however virtually no empirical data exists about those directly involved. Fieldwork with active offenders can be dangerous and challenging to conduct, however, in order to gather the most complete data possible, I made the decision to interview offenders directly involved in the illegal tiger trade. Ned Polsky, an American sociologist and author of *Hustlers, Beats, and Others* (1967) defines this type of on-the-ground fieldwork as a move away from secondhand information, an abandonment of “jailhouse sociology”, and a shift in focus toward the “messy reality” of deviance as constructed by criminals. Put bluntly, in order to understand the dynamics of tiger poaching, I endeavored to simply ask those

involved. Of course, this task was not simple, but I hope my experience helps future researchers in similar tasks.

My research was influenced by edge ethnography² and naturalistic inquiry, as advocated by Ferrell's research (e.g., 1997) and his methods of being a complete participant in criminological research. I used ethnographic methods to enter the world of poachers, as I felt acquiring information from offenders themselves offers undiluted information that is crucial and cannot be acquired with as much accuracy in any other way. However, I never engaged in tiger poaching and so separate myself from those who actively participated in the crimes I was researching (see, e.g., Adler 1985; Ferrell 1996, 2018). Beyond what one's Institutional Review Board (IRB) proposal requires, there are ethical limits on what a researcher should or should not do in the field, those being defined by the researcher's own morals.

The goals for this paper are threefold: (1) to stimulate a greater confidence in the methodology of ethnography for collecting first-hand data involving criminals and their organization and activity; (2) to elucidate how these methods can contribute to understanding context-specificity and nuances; and (3) to provide an example of how ethnography can be integrated into a field historically dominated by natural sciences. Following this introduction, I describe how ethnography has been used historically,

² Edge ethnography is a variant of traditional qualitative methods where the researcher often intentionally situates themselves in risky situations (sometime covertly), wherein the role distinctions between researcher and criminal subjects can become blurred. This method emphasizes understanding deviant groups and settings through complete immersion into the culture or setting being studied (see Miller and Miller, 2015; Miller and Tewksbury, 2010; Ferrell, 1997).

and how it can be used in wildlife crime. I then discuss why I chose to study tiger poaching in the RFE and describe my study area and research design. This is followed by a description of how I used ethnographic methods to achieve a research goal in a field dominated by natural sciences, and some key insights I learned. Discussion and conclusions follow.

Historical use of ethnography and its applicability to the RFE and wildlife crime

The orthodox definition of crime and deviance are societal constructions, where behaviors are criminalized as defined by the state in the form of administrative and regulatory law (Wyatt 2013). If crime has no ontological reality (Hillyard and Tombs 2004), it manifests subjectively, and cannot rely solely on positivist methods of inquiry (Fleetwood and Potter 2017). Ethnography, as a fluid and adaptable research method, both interpretive and immersive, is a method that strives to transcend scientific objectivity. The methods associated with ethnography, focusing on participant observation and interviewing, allow the investigator to embed themselves near or within a phenomenon to gain a deep understanding of a group's lived experiences, including shared culture, conventions, and social dynamics (Ferrell 1997). Ethnography captures context – nuances and individual subjectivities – about a topic from a first-hand, on-the-ground perspective, which makes it an ideal method to use when virtually no empirical data exists (Moreto 2016). Ethnographic methods place emphasis on the meanings, perceptions, and beliefs held by participants,

enabling them to speak for themselves, and allowing their social realities to be depicted in intimate detail (Eliason 2004).

The two academic disciplines traditionally associated with ethnography are anthropology and sociology (Adler and Adler 1987), however, much criminological theory developed from ethnographic research during the early 20th century, especially the Chicago school of criminology and sociology (e.g., Park et al. 1925) (Atkinson et al. 2001; Hochstetler and Copes 2016). Criminological research during the second half of the 20th century was fundamentally positivist and reliant on quantitative data. While this epistemological frame remains dominant in contemporary studies, particularly in the US, ethnography received a resurgence of attention in the 1990s when cultural criminology gained recognition as an emergent criminological perspective (Treadwell 2019). Cultural criminology directs its focus on the layering of culture merging with large scale societal structures (e.g., political influence, industrial activity, economic fluctuations) to influence the everyday lives and decisions of actors who commit crimes (Kane 2004). Melding the cultural and postmodern studies emerging in European discourse with the contemporary American Chicago School of criminology³, the emergent and hybrid nature of cultural criminology explores deviancy within the context of culture, the rise of deviant

³ Early on in cultural criminology, the US movement was predominately focused on issues of situated meaning, while the European adaptation, with roots in critical criminology, was more concerned with structural issues linked to capitalism and power (Hayward, 2016). The two movements shared their focus on existential agency, influenced strongly by Katz's (1988) authoritative *Seductions of Crime* and Stephen Lyng's (1990) concept of 'edgework, which allowed for collaborate and development of the perspective. Cultural criminology today can be conceptualized "as a triadic framework concerned with meaning, power and existential accounts of crime, punishment and control." (Hayward, 2016, pp. 300).

subcultures as mechanisms that foster criminality, and the influence of power relations and social control within the mediated construction of crime (Hayward and Young 2012; Ferrell 1999).

Through the intellectual exploration of the convergence of culture and criminal processes into contemporary social life, cultural criminology highlights the importance of ethnographic work with a particular focus on subjectivity and reflexivity (Ferrell 1999). In this way it frames inquiry based on integration of the social context, something that traditionally has been ignored in quantitative social science research (Sankofa et al. 2017). Within the field of criminology, ethnographic research most frequently involves observation of, and at times participation in, the activities of deviant populations (Ferrell 1997; Ferrell and Hamm 1998). This work usually necessitates *verstehen*, a researcher's subjective understanding of a criminal. This process engenders an empathetic understanding for the context of the lived social reality for those that you study (Ferrell 1997). *Verstehen* is cultural criminology's response to conventional criminology's fixation with objectivity, by placing emphasis on subjective experiences and meanings to gain deeper insight into deviant behaviors (Mills and Fleetwood 2019).

Due to the focus on human experience, ethnography is well suited for criminological inquiry, to discern the *modus operandi* of criminals, including their decisions and the contexts where their decisions are made and carried out (Cornish and Clarke 2003). These details can help elucidate the broader social and cultural structures that foster subculture deviant behavior (Fleetwood and Potter 2017). By

focusing on the context and intimate details of a setting, a researcher can focus on the motivation frameworks of criminals, teasing out both the empirical and emotive aspects of crime. Reliance on quantification can bury important situational characteristics that can be critical to understanding how crime is mentally scripted and physically accomplished (Miller et al. 2015). Quantification can obscure individual reality and meaning, while ethnography seeks to understand emotive foundations and motivation frameworks of perspective and behavior of offenders (Young 2011).

Ethnography is a robust methodological approach to explore the layered complexity and variability that define wildlife crimes (e.g., Van Uhm and Siegel 2016; Pires et al. 2016; Moreto 2016), due to its ability to capture the disparities between settings, drivers, species in demand, and individuals involved. Generalizations, a goal of quantitative methods, can be tangential to exposing the critical details in understanding the nuances of wildlife crime. Ethnography, by placing emphasis on the constant comparison between what participants say and do across interviews demonstrates great potential to contribute to theory and inform context-specific policy solutions (Hochstetler and Copes 2016).

A legacy from early criminological research is the acknowledgment that offenders are generally not social outcasts and that criminal lifestyles are connected with local economies – they often reflect the activities of informal or illegal markets. Criminal identities become nested in the subculture society in which they develop and occur (Levi 1981). Ethnography is well suited to address the role of subculture and

the transmission of criminogenic values (Miller and Miller 2015) and thus can aid in uncovering how wildlife crime relates to deviant subcultures and peripheral environments. Fraser (2013:252) emphasizes:

While ethnography remains marginal within mainstream Anglo-American criminology, it is a method particularly well attuned to illuminating the deep-seated tensions, fragmented realities and hybridized identities that emerge from the margins of globalization; and for developing theory that speaks to the shifting boundaries of power, politics and identity in the contemporary era.

Ethnographic research is uniquely suitable for the study of borders, boundaries, margins and edges of cultures, nations, disciplines, and legality (Khosravi 2010). Peripheral environments, characterized by ambiguity and contradictions, are amenable to ethnographic inquiry (Fraser 2013). Conventional crime constructions have most likely marginalized the groups within such environments, therefore, by attentively documenting the lived realities of these groups, the marginalization process can be better understood and the production of alternative images of deviance can be brought forward (Ferrell 1999).

In the RFE, in lieu of a coherent and functioning government, corruption and obligate self-sufficiency persists. Systems of behaviors, values, and societal norms support various forms of criminal behavior, creating an embedded and systemic subculture. Here, the discrete act of a wildlife crime occurs within a criminal subculture of deviance, then again within a larger system of power structures and economic, political, and social relationships. Qualitative criminology can aid in

understanding this complex milieu, as it places emphasis on the layering of these relationships and how large-scale societal influences or patterns ultimately influence the actions of individuals in daily life (Kane 2004). In the context of the RFE, the intersection between entrenched structural contradictions due to the government's inability to meet the basic needs of its citizens, economic asymmetries, and social stratifications merge to engender a state of societal anomie⁴ resulting in chronic instability. Ethnography, via a lens of capturing organic and nuanced social reality, can help us understand this process, elucidate the resultant poaching subculture, and point in the direction of interventions and reforms to protect endangered wildlife.

Case selection: Amur tigers in the RFE

At the beginning of the 20th century there were approximately 100,000 tigers; today their population is below 3,500 individuals, and they occur in only 7% of their historic range (Goodrich et al. 2015). Population declines are due to habitat loss and fragmentation, loss of prey base and poaching for international trade. Although tigers face a multitude of threats, poaching is generally accepted among experts to be the most immediate threat to their survival (Moyle 2009). Studies have examined the last link of the poaching supply chain: the domestic markets in China (Moyle 2009; Wong 2016; Van Uhm 2018; Van Uhm and Wong 2019) and Nepal (Karmacharya et al.

⁴ Originally conceptualized by Durkheim (1893/1984), in sociology, anomie is a societal condition where there is a breakdown or disappearance of shared societal norms and values that bind community and regulate behavior. This disintegration of previously held beliefs and standards usually follows periods of drastic and rapid changes to the social, economic, or political societal structures. High rates of crime, corruption and deviance are common symptoms. Passas (2000) gives a description of anomie in modern times, using Russia as an example, where societal anomie occurred after the collapse of the USSR.

2018). However, the first link, including the range of people involved, their motives and methods, and associated links to the commercial trade, has rarely been examined. Studies in Bangladesh (Saif et al. 2018), Indonesia (Shepherd and Magnus 2004) and Sumatra (Risdianto et al. 2016) stand out with this focus.

In Russia, poaching has been identified as the most direct threat to the Amur tiger subspecies (Robinson et al. 2015), however, only anecdotal information exists about motivations and methods, who is involved, and the structure of the supply chain. The RFE is the last stronghold of the Amur subspecies, which hovers around 300 adults. My research sought to gather the first empirical evidence of the illegal tiger trade in this understudied region. I addressed three questions: (1) What are the motivations and methods behind the poaching of Amur tigers in the Russian Far East? (2) What is the structure and organization of the supply chain of tiger parts and derivatives from Russia into China? (3) Is the population of Amur tigers in the Russian Far East stable?

Based on anecdotal information and conversations with a confidential source within Russia, I knew tigers to be a highly political topic – a reality I knew would complicate my research. Many Russian government officials, protected area managers and members of the FSB⁵. are aware of the extent of tiger poaching and are not being truthful to the international conservation community about this information. Members of these agencies are often involved in some aspect of the poaching or trafficking

⁵ Federal Security Service of the Russian Federation (FSB) is the principal internal security agency of Russia and the main successor agency to the USSR's Committee for State Security (KGB).

themselves and are actively pushing false information about the extent of the problem (Skidmore, 2021b).

Research Design

I sought primary data from the first-hand accounts of the individuals who are directly involved in the illegal tiger trade (e.g. poachers, middlemen, buyers and smugglers). The extant range of Amur tigers encompasses two distinct regions in the RFE, Primorye and Khabarovsk. I chose Primorye as the location of this study as approximately 80% of the Amur tiger range falls within this region. Data collection comprised of two separate trips, January-February 2019 and January-March 2020, for a total of 5 months in the field. This study utilized an ethnographic case study approach, and my goal was to conduct qualitative conservation science research from a criminological perspective. I drew closely from the work of Van Uhm (2016), Moreto (2016), and Moreto and Lemieux (2015a) to develop my methodology, as these studies used ethnography to explore the nuances of wildlife crime issues. I also drew from the work of Wyatt (2009, 2011, 2014) whose qualitative research on wildlife crime in the RFE inspired me to further delve into the subject.

Today, within the methodological literature, ethnography is defined using a variety of typologies. Identifying a canon can be an elusive and ambiguous task (Hammersley 2018). Despite this, Walford (2009) argues that although traditions change and evolve, there must be recognizable continuity within what is considered 'ethnography'. These criteria include "long-term engagement, the use of multiple

research methods and the generation of rich data. The research process also needs to be theory-led and systematic” (Walford 2009: 273). Traditionally, within sociology and anthropology, classic ethnography requires deep immersion into a foreign culture to acquire ‘thick description’ of the subject of inquiry and requires the long-term engagement of the researcher (Geertz 1973). The time required to ‘do’ ethnography does not seem to be set but is an “extended period of time” (Hammersley and Atkinson 2007: 3). Other methodological criteria that seem to be agreed upon by most is that ethnography requires direct observation from the researcher in a naturally occurring setting and that the method of participant observation is “...often seen as a core element, if not *the* core, of ethnography.” (Hammersley 2018: 8)

Miller and Miller (2015) suggest that criminological ethnography is rooted firmly in naturalistic inquiry and that ethnographic concepts like nonjudgement positionality, contextualization of study setting, and recognition of social network and structure help a researcher with this task. I believe that what is important about ethnography is dedication to capture a culture through the organic collection of data, to provide a deep analysis of a social world from the members’ perspectives and to maintain the integrity of the phenomenon in question.

My study was not classic ethnography in terms of its length of time or full immersion since my total time in the field for this particular study was five months broken between two visits. These research trips followed multiple trips to the region to participate in The Amur Tiger Symposium in Khabarovsk and in tiger monitoring research in Durmin in Khabarovsk Krai, therefore I was already familiar with the

region and culture prior to beginning my data collection. Importantly, my study was centered around dedication to an ethnographic approach and methods. The shorter time frame can be justified in part by the length of time poachers are accessible in the taiga during the Russian winter, as well as the nature of my research – I had prior knowledge that Russian authorities did not want this research project moving forward, which became a reality when I was pursued by the FSB. Although I was deported from Russia before my planned study length was completed, after completing 116 interviews in addition to participant observation, I feel confident I reached data saturation for this topic and I had not planned to stay longer than one extra month.

My study was necessarily multi-sited. Rather than following a more traditional ethnographic method, where inquiry is framed within an intensively focused-upon single site of observation, I employed multi-sited ethnography, which facilitates a deep and grounded understanding of a particular cultural or social phenomenon (Van Uhm 2016; Siegel 2009). Multi-sited ethnography considers regional dynamics – how the local and regional are now inextricably connected – and frames an object of study that cannot be understood by remaining focused on a single site of concentrated examination (Marcus 1995). This method also allows the researcher to follow the subject of inquiry - the people, the practice, the object, the idea, the story, the symbol or the conflict (in my case, the illegal tiger trade) along its entire route (Marcus 1995; Van Uhm 2016). Shah (2017:11) strongly asserts, all

ethnography *is* multi-sited in that, “Inevitably, to understand the social relations that the people we study are embedded in, we must work across time and space.”

I blended the methods of participant observations and semi-structured interviews, with a focus on the comfort and security of the participant, due to the sensitive and clandestine nature of the topic. Extensive effort and time went into building trust with participants, which included participating in sociocultural norms and activities (e.g., meal sharing, going to the *banya*⁶, going into the taiga⁷ on snowmobiles/skis and drinking vodka). Participation in such activities and forming social relationships with participants was essential to gain trust. In total, I spoke to 116 participants; these talks ranged from quick semi-structured interviews that lasted 30-45 minutes, to multiple day interactions that incorporated several informal interview sessions and hours of participant observations. Conversations varied from one-on-one talks to group-setting interviews, including conversations over a meal and spending the night in a participant’s residence. In total, 43 participants (37%) were involved in the poaching or trafficking of tigers (n=31 admitted tiger poacher; n=12 admitted tiger buyer). What follows are some key insights and reflections from conducting ethnographic work in a complex region on a challenging subject.

⁶ In Russian culture, the *banya* or sauna, is a vital part of life.

⁷ The colloquial name for the boreal forest in the Russia Far East.

Context matters – situating the research location

The conservation of tigers in the RFE is inextricably linked to the region's geo-political situation. The region, characterized by abundant, valuable natural resources, is also one of the most remote, impoverished, and corrupt regions in Russia (Wyatt 2014). Moscow is nine time zones away and following *perestroika*, the formal collapse of the Soviet Union in 1991, there was an extensive dissolution of management, investment, government resources and industry by the central government. Historically, the RFE was almost exclusively resource-dependent; as an outlying region it was locked into an enduring colonial type of economic relationship with European Russia, which included heavy subsidization of industry (Bradshaw and Lynn 1998). After *perestroika*, virtually all forms of economic assistance and government support evaporated and almost immediately the RFE began to experience a protracted socio-economic crisis. Privatization of state-owned companies in the absence of a credible regulatory regime led to a criminalization of the economy (Passas 2000). Structural asymmetries due to a breakdown of a functioning government marginalized most of the population, as without the state managing essential services, the region failed to maintain basic social and economic infrastructure (Poelzer 1995; Newell and Henry 2017). Increased crime, capital flight, emigration, and poverty became characteristic of society.

The devolution of decision-making power and legal authority also eroded legitimacy within environmental state agencies, causing the deinstitutionalization of

environmental regulation (Mol 2009). The stagnation and erosion of policies on natural resources led to entrenched confusion, corruption and ineffectiveness, leaving a legacy of glaring disparity between Russia's formal environmental laws and state agency capacity and interest in enforcing them. *Perestroika* opened the border with China, leading to an influx of Chinese citizens offering money and basic necessities for trade opportunities of the RFE's natural resources (Braden 2014). The open border substantially increased poaching of protected wildlife, game species and other natural resources (e.g., timber and ginseng). Scholars define the illegal harvest of natural resources as Russia's most persistent and intractable environment challenge (Newell and Henry 2017).

Without government support, the RFE has become increasingly self-sufficient. The people, many of whom are hunters, progressively began to rely on a subsistence lifestyle, with hunting being the most common way to eat and make a living. Marginalization by the state, coupled with an open border with China and little oversight over commerce, contributed significantly to the creation of an informal shadow economy that many Russians came to rely on (Kuhrt 2012). This informal economy flourished; similar to legal and state-controlled economic operations, informal and illegal economies in the RFE formed networks of mutual aid, reciprocity and cooperation (Holzlehner 2006). This informal economy has fostered a subculture of corruption and the illegal harvest of the region's natural resources.

In their book on environmental crime in Russia, Stoecker and Shakirova (2014) discuss how corruption is so endemic in Russian society that an inherent

system of commonplace norms and values allowing for the inclusion of corrupt practices has permeated everyday life. These principles, legitimizing and fostering corruption, have become embedded so deeply that they are often inseparable from daily socio-economic relations and are accepted by the citizenry on the same level as formalized laws (Ledeneva 2013). Corruption has become so routine that there is a generalized belief that nothing will get done *without* corrupt practices (Stoecker and Shakirova 2014). This set of behaviors and norms is pronounced in the RFE and has engendered a condition of societal anomie influenced by criminogenic asymmetries and a subculture of normalized deviance. In sum, the RFE has specific characteristics that make it especially vulnerable to poaching: remoteness, poverty and unemployment, abundant natural resources that are poorly managed and monitored, high external demand, stultifying bureaucratic processes, high levels of corruption, and a society of obligatory self-sufficiency.

Collecting wildlife crime field data

Preparation for the field and my exploratory trip

I knew ethnographic field work as a foreigner in a country as notoriously difficult as Russia would be a challenge. Further, my topic of wildlife trafficking would put me in front of those directly involved in illegal activity. I could expect to find myself in difficult, unpredictable, and unexpected situations. As a conservation biologist with a background as a ranger in South Africa, I knew that I had the necessary mental and physical skills and situational awareness to feel confident

conducting this work. However, it is important to emphasize that not every scientist should engage in ethnographic field work with active criminals in a location that can be dangerous. Due to the illegal and covert nature of the activities I sought to investigate, many details are impossible to account for or plan for in advance. Once you get into the field, unanticipated situations will happen, so you must know beforehand that you can handle the unexpected.

Based on the complexity of my study, and logistically due to the remote area and the illegal and political nature of my topic, two separate research trips were planned. To the best of my knowledge, my study would be the first detailed examination of Amur tiger poaching, so my first priority was to establish that I could, in fact, locate and speak with those engaged in this activity. Understanding the context of my study region prior to entry was crucial. For example, I knew poachers would be part of the hunting community, and based on preparatory research, I knew they would be in the taiga in hunting concessions during the winter months. Wintertime would therefore be the best opportunity to locate necessary participants. Through a confidential source within Russia, I received tips on cultural nuances. For example, I learned I should bring small tokens of appreciation for interviewees' time: vodka and Leatherman knives. These gestures helped me build trust and establish rapport. This task of building trust with key participants was the most important aspect of my exploratory trip. Besides developing trust, I was able to set up future plans for meetings when I returned for my full-length study. Some participants I met during my initial trip did not disclose critical information to me about tiger poaching

until I came back for my second trip a year later. My participants took my word very seriously – by returning the following year, I held up my promise of returning, proving that I was trustworthy and serious about the research. Gaining familiarity with the locations and culture was essential. I had already been to Russia on multiple occasions, including my study region, where I spoke at a conference on Amur tigers the previous year. However, I knew the more context-specific details I learned about Primorye, the better prepared I would be. I took the opportunity during the exploratory trip to acquire as much interview data as possible. By doing so, I was able to begin to recognize important trends and start developing themes, thus aiding my preparation for my subsequent research trip.

During my exploratory trip I needed to understand and mitigate risks as much as possible. I learned from my confidential source that having my information confiscated and being deported would be my biggest risk, due to the political nature of my topic and the government's desire to keep tiger poaching information confidential. This source informed me that acquiring a scientific exchange visa, rather than a tourist visa, would be vital. Visitors claiming to be foreign scientists can be met with skepticism bordering on paranoia; therefore, such a visa would establish my legitimacy to conduct research in Russia. I would be uncovering information I suspected would implicate the government, so I needed every type of leverage available. As I was eventually deported from Russia, this visa became critical. Along with the visa, I knew I needed to not draw attention to myself during my exploratory trip. Tigers are politically sensitive, and I knew in advance that the government and

FSB had some level of involvement and/or knowledge about the poaching occurring. I would need to return to Russia the following year for my full-length study, so needed to maintain a low profile on my first visit. This included not visiting regions that I knew were political, had a high level of government presence or particularly high levels of corruption – I saved these locations for my second trip.

I needed to establish what characteristics (personality, age, sex) of interpreter would work best for my full-length study. I worked with three interpreters during my exploratory study and decided it would be best to work with a young woman, like myself. To generalize, women are considered non-threatening and submissive in Russia. As a woman from the West, I would generally be offended by such positionality, however, in this setting, it was crucial. By appearing non-threatening to participants, my interpreter and I would have a greater chance of acquiring the information I needed. I must emphasize the importance of finding the right interpreter, as it is not an exercise that should be taken lightly, and I spent months finding someone I knew would not only interpret but understand the importance of the work. For this type of subject, an interpreter and researcher must have a connection and comradery; my interpreter and I developed a strong bond – we had our own sense of rapport and trust – that was not only crucial for acquiring information, but also important for our safety.

Finally, due to the nature of my research, interviewing human subjects who are in some cases active criminals, I undertook an extensive Institutional Review Board (IRB) application process (University of California Santa Cruz IRB #

HS3434). Most importantly, within this application, I had to explain how I would present myself to participants (overtly as a student researcher) and the how I would guarantee the anonymity of willing participants (no identifying names/features would be taken, and no recording devices would be used). All participants provided verbal informed consent.

Gaining access and entering the criminal world

Due to the covert and often unreported nature of criminal networks, finding those engaged in illegal activity can be a difficult task. The people involved are hidden populations outside the scope of conventional society, and they often purposely conceal their activities due to their illegality (Van Uhm 2016). Wildlife crime is facilitated by corruption, weak governance, and lack of enforcement (Wellsmith 2011; Wyatt 2013; Wyatt et al. 2018; Van Uhm 2018). In the RFE, the criminalization of many aspects of society has engendered systemic corruption and organized crime, both of which have been shown to be associated with wildlife and environmental crimes in that region (Wyatt, 2009, 2011, 2014). Gaining insider status with those that have extensive knowledge of how the illegal tiger trade is facilitated was essential. I also had to physically locate these people; the RFE is remote, has one of the lowest population densities in the world, there is generally no cell coverage, the climate is extreme (often -30 C in winter), and moving from village to village requires a 4x4 truck. This environment is not conducive to easily finding people to interview. In order to focus as much as possible on my research and to mitigate the possible influence on participant behavior that two women alone in a remote and

male-dominated environment might have, I hired an older local Russian to drive my interpreter and I around for the duration of my study. Due to the extreme climate during this time of year and lack of maintained roadways, his local knowledge of remote villages and accessibility proved vital, as we covered approximately 7000 kilometers by car. My driver proved to be excellent at melting into the background and was not present for interviews, however his masculine presence could have aided in reassuring participants in speaking with me.

Purposive sampling, a type of nonprobability sampling, was utilized; participants were chosen subjectively based on specific characteristics rather than being representative of the entire population (Bernard 2011). My initial task was to locate hunters, as poachers are a part of the larger hunting community. The Primorye region is divided into approximately 100 hunting leases, which are sites managed for the legal hunting of game species. Hunters buy a permit from the lease manager, which allows them to hunt a certain number of animals. These hunting leases were critical for my recruiting process as they were the means by which I was able to connect to those in the hunting community. For the initial stage of the recruiting process, I needed a gatekeeper to facilitate access to the hunting community. In my situation, researching illegal activities, it is essential that my gatekeeper's identity remains a secret. Through my gatekeeper, I was able to make initial contact with a few managers of hunting leases who subsequently asked hunters if they would be willing to speak to me. These initial introductions led to a snowball sampling method, where future participants were recruited among acquaintances of those I was initially

introduced to (Goodman 1961). I followed this method for every new location I went, often getting references or introductions from participants to others in their network.

One should not expect to find a gatekeeper on their first visit to a region. It would be inaccurate to even say that one “looks for” a gatekeeper. The meeting or connection is more fortuitous, which makes research in the area possible. The sequence of events is not as clear as identifying a research topic and finding the gatekeeper; rather, the discovery of the gatekeeper creates the opportunity for the research to occur. Building a trusting relationship with a gatekeeper occurs over time through professional and personal connections with individuals with partial knowledge of the study topic and who provide guidance and character references moving forward. The relationship a researcher has with a gatekeeper can vary; a gatekeeper assists, but in some cases, even controls the process of a researcher accessing a site and participants (Ball 2020). Interactions with my gatekeeper occurred at the beginning of my research, setting up the first few introductions. I then used the snowball sampling method from there, no longer communicating with the gatekeeper. This level of engagement, at the onset of the project, was sufficient to help define the study and launch the fieldwork. Also, for security reasons to keep my gatekeeper’s identity a secret, limited contact was essential.

Polsky discusses entrée into the world of criminals, emphasizing, “In studying a criminal it is important to realize that he will be studying you, and to let him study you” (1967:132). Ethnography can make the researcher feel vulnerable, exposed.

Similar to reflections from earlier criminological studies, emphasized by Hochstetler and Copes (2016), I found poachers in Russia are generally not social outcasts or introverts. They are part of the hunting subculture community and are usually gregarious individuals. As such, they were curious about me, questioned me, studied me, and I had to let this process happen. I learned how important it would be to have a reciprocal sharing of information. Ethnographic research necessitates expecting the unexpected and being able to take advantage of chance encounters and unforeseen circumstances. Regardless of prior knowledge or preparation, ethnography's close alliance with grounded theory (Charmaz 2006; Van Uhm and Seigel 2016), necessitates an inductive research process: letting the data guide the research in the field. To do ethnography, a researcher must be comfortable with not always being in control of where the research takes you.

Establishing an identity and discussing illegal activity

Establishing an identity before you enter the field is vital – know who you are. Polsky (1967:125) writes: “In field investigating, before you can tell a criminal who you are and make it stick, you have to know this yourself, know where you draw the line between you and him.” Interviewing those involved in illegal activities requires a distinctive method that is both cautious but also assertive at the same time. My first interviews were awkward, sounded scripted and I had a difficult time establishing an ‘identity’ – how should I present myself? I have to be forthright in my role as a researcher but sounding like a researcher not only bored my participants, but sometimes made them uncomfortable. I learned how to manipulate my tone and

approach to be more conversational: to sound like a friend or neighbor. Body language, tone, eye contact and the way questions are phrased are particularly important. I also had to decide how to introduce myself, as I could not directly say outright that I was a researcher interested in tiger poaching. Academics and Westerners can be met with skepticism in the RFE. I also did not want to suggest an unbalanced power dynamic with those I wanted to speak to, or I would have most likely been met with suspicion. As per my IRB application, my approach was to introduce myself as a student researching hunting in Russia. Only after establishing comfort and rapport with a participant would I begin to discuss the more difficult and sensitive topics of poaching.

I learned that if I want to know about tiger poaching, I do not begin by asking about tiger poaching. As O'Reilly (2005) discusses, an 'iterative-inductive' approach is important, where questioning begins in a passive and indirect way. I would ask questions about how and when they learned how to hunt, what they like about being in the taiga, and personal questions about friends and family. These types of questions are critical to building trust, understanding important contextual details, and letting themes emerge naturally. People loved to talk about themselves. I learned to point them in a direction and let them get to the details I wanted in their own time. Similar to Van Uhm's (2016) research, my participants would often begin to tell me about a 'friend' who was involved in tiger poaching, later admitting that they themselves were also involved.

Limiting what you say, unless asked, may sound like a small detail, but it is essential. Do not put words in your participant's mouths. The purpose of ethnography is to not assume what is important, but to let the subject tell you what is important. The best way to get participants to talk is to simply let them – another strength of criminological ethnography, as these methods are best for the discussion of sensitive or complex topics. Structured questionnaires, frequently used in quantitative studies, impose artificial categories on questions that are a reflection of the researcher's own bias and ideology, and also constrain responses (Drury et al. 2011; Hochstetler and Copes 2016). I chose to conduct semi-structured interviews, a method that necessitates openness and flexibility during conversations (Davies and Francis 2011). I would prompt the participant and at times steer the conversation, but I learned the most from when I let the participant talk. I became adept at leading questions and making it seem like I already was 'in the know.' If participants thought I already knew a lot of information, then I was 'in the club' and they were more willing to talk to me.

Participant observations

There is ongoing debate as to what constitutes participant observation (Adler and Adler 1987); here, I define it similar to Van Uhm (2016), in that I participated in the everyday lives of poachers, seeking to disrupt their routines as little as possible,

but did not actively participate in poaching⁸. I did, however, see the aftermath of poaching. For example, I was shown processed tiger products multiple times and taken into the forest to see a tiger carcass. DeWalt and DeWalt (2011) refer to this type of participant observation as direct, naturalistic observation and it facilitates a more in-depth understanding of the general context of the everyday lives of participants, as well as their *modus operandi*, that cannot be gleaned from interviews alone.

At the beginning of my field work I made every attempt to get one-on-one interviews with participants. However, I quickly learned that many participants felt more comfortable speaking in a group setting, typically with their hunting partners and usually felt more comfortable in their home. If I was introduced to a participant in a more formal setting, (i.e., an office), I actively sought invitation to a hunting base⁹ or to the home of the participant for a meal or *banya*. These are social activities, where people are drinking, become more relaxed and gossip is shared. These types of participant observations can often turn into informal, spontaneous chats and during these informal settings I could note important details that I would not necessarily have access to during a formal interview. The prosaic day to day activities of my participants often led to unexpected conversations. Capitalizing on these chance

⁸ Regardless of the ethical limits imposed by the IRB, the limits of ethnography can be morally subjective, and in this case, I would have never considered poaching a tiger. Protecting tigers was the fundamental impetus of my work.

⁹ Hunting bases are usually located in remote areas, on hunting leases. They are permanent communal living cabins that groups of hunters will use as a base to hunt. They are used for a large portion of the winter months by the men who belong to a hunting lease.

encounters, chance opportunities, became an unanticipated well of opportunity for knowledge.

Hunting is an essential part of the culture – the lives of locals in the RFE are structured around it. During hunting season, friends come together, are gregarious and love to drink and gossip. I obtained much more information in informal group settings and adapted my approach to fit this reality. I would speak to 4 or 5 hunters at once, assess who knew what, develop camaraderie and then seek one-on-one conversations with those I felt could especially aid my research. I knew my prior professional background as a ranger would be helpful, and the ease at which I adjusted to the life in the RFE made it possible for me to acquire sensitive information. Participant observation in organic settings engender trust and comfortability. Because of this I was able to establish insider status, gain better access to participants and their activities, and obtain a more nuanced understanding of the phenomena I was investigating. Gaining access, establishing trust and legitimacy was never a static development, but an ongoing and negotiated process within the study population (Berg 2004).

I learned to take advantage of my relevant personal qualities or experience. Polsky (1967: 133) writes “Where and how you start depends, other things being equal, on what you do best that criminals are also likely to be interested in.” I spent many months understanding the nuances of this region and culture and learned I had specific skills that participants would be interested in. These hunters were just as curious about me as I was about them and they wanted me to join their lives. I visited

their homes, cooked dinner with them and drank vodka with them. Understanding context and culture is critical and vodka is a central part of life in the RFE. In a region where hobbies are few and temperatures drop to -30 C, vodka and meal sharing brings family and friends together. I went snowmobiling and skiing with the people I met and once they learned about my experience with a rifle, I found myself a few times in the forest shooting targets with an old SKS rifle. I looked at photo albums, learned about their grandkids and asked them about their lives – and they asked me about mine. I even sang karaoke, a beloved pastime in this culture, and learned to play Russian card games. I joined a snowmobile parade and was serenaded with an accordion. This type of camaraderie is essential for trust building and information sharing, for developing my insider status.

Many interesting findings are unanticipated, which is why gaining access to the personal lives of participants through participant observation is critical. For example, on my exploratory trip, I stayed overnight in the home of hunters and their families in a very remote village. These hunters claimed that they had no formal employment, that they were subsistence hunters, but not poachers. What I noticed about their lives however did not match up with those claims: they had an expensive Toyota SUV, their own wireless internet router, and plumbing (all rare and expensive in all rural Russia, especially the Far East). In the West, these types of modern conveniences are so prevalent that they are not even noticed. In the RFE I took note of them almost immediately because of their rarity. 8 hours and a few drinks later and they unabashedly admitted to me what I already suspected: they were tiger poachers.

Participant observation is important because it provides a greater chance of stumbling accidentally into unplanned information that can turn out to be significant.

Reliability of data

One of the primary threats to the internal validity of a study involving active offenders is deception (Fader 2016), which I discouraged and countered to the best of my ability in a variety of ways. This included the amount of time that went into developing trust and rapport. An ethnographer must recognize and account for the existence of Hawthorne effects that occur when the presence of the researcher changes the way subjects behave and what they disclose (Oswald et al. 2014). Hawthorne effects can taint observational data and interviews. My research design, which included hundreds of hours of participant observation, helped mitigate these effects. My exploratory trip was also important in this regard. By developing trust and rapport with participants over multiple years and visits, I was able to feel more confident about the reliability of my participants' information. My chosen snowball sampling design method also facilitated trust. Recruiting participants through individuals that could vouch for my sincerity and motives alleviated feelings of mistrust and suspicion. Additionally, I allowed participants to select the location of our meetings. With no scholarly data available, my research on this topic in this location was novel, making data triangulation with other sources more difficult. However, my sample size of 116 participants was relatively large, aiding in data triangulation. To probe for any inconsistencies that arose during the interview I

would repeat questions later in the conversation with a participant, ask the same question in a different way and repeat the same questions to other people in a separate setting.

As per my IRB application, I gave full anonymity to participants and did not record any interviews, due to the risk to the participants should my data be confiscated. However, based on a review of the literature in advance, (Polsky 1967; Van Uhm 2018) I would have chosen not to record the interviews anyway, due to the possibility that it would change the way people spoke to me and what they spoke about. Technology can alter the behavior of participants, especially those dealing in illegal goods, as its use can influence what they disclose. Organic, informal discussions, without recording devices, made my participants feel more at ease and helped avoid potential Hawthorne effects. During the interviews I took extensive notes for each question, directing my interpreter to clarify specific details, expand a response, or pause for me to catch up with my notetaking when needed. Most of my notes included just the relevant details, however, verbatim quotes were also frequently recorded. During the interviews I also observed and recorded participants behavior and demeanor. These notes, both observational and interview, were reviewed, and discussions took place with my interpreter for clarity and accuracy as soon as possible following each interview. As a precaution, I transcribed my notes into my computer, saved them in the cloud and then deleted everything from my hard drive every night.

Emotional Reflections

There is a constant tension in ethnography between the balance of subjectivity and objectivity, between involvement and detachment (Adler and Adler 1987). My research was no exception to this ongoing methodological debate. During this type of study, as deep immersion into the culture builds trust and establishes rapport, there can be an impetus to sympathize, defend, and even facilitate the behaviors one is studying. There can also be an impulse to be repulsed and take immediate action against what one sees. Regardless of what I heard and saw, I sought to retain emotional distance as a researcher. Ethnography is at the same time predicated on intimacy with participants, while reliant on neutrality and detachment as an inquirer. This is a complicated, constant, and emotional balancing act. During my time in the field, everything relied on my ability to remain neutral during discussions about poaching tigers, about seeing dead tigers in the forest, about bearing witness to their parts being sold as products, and neutral about how it is just ‘business’ for some people. As a lover of wildlife, it was truly one of the greatest challenges on my life to remain detached and objective during these situations, but it was *imperative* that I did. Any judgements on my part perceived by participants would result in cessation of sharing information or even worse, being turned in to the FSB.

Criminological *verstehen*, described concisely by Miller and Fleetwood (2019) as the process of sustained presence, immersion and participation within the culture of study, enable the ethnographer to get inside the logics of criminal behavior.

This process, engendering subjective interpretation and sympathetic understanding of those I was studying, was essential for me and was an ongoing and negotiated process with myself. I needed to engage in constant reflection – to think of the broader context that could be impacting the individual realities of participants. Along with *verstehen*, I needed to be wary of where I drew the line between myself and my participants. Many of these people are charismatic and they are survivors. Being empathetic to their lives is natural, but in this type of research one must always be wary of how participants can negotiate their own reality. Sykes and Matza (1957) contend that law-breaking individuals can account for their behavior by utilizing ‘techniques of neutralization’¹⁰. In the context of environmental crime and harm (Wyatt and Brisman 2017) and wildlife crime (Eliason 1999, 2004; Skidmore 2021b), offenders are known to use neutralization techniques to rationalize or justify their behavior. Based on my interviews, neutralization techniques that include ignorance of the law, lack of care about laws viewed as unfair, and lack of respect for corrupt authority and/or government, seem to be evident with those engaged in the illegal tiger trade. A researcher must be prepared mentally for criminals to rationalize their behavior. In the field I learned a constant balancing act was required between sympathetic understanding and objective detachment.

While I did not want the focus of this article to be made via a gendered lens (for an account of gender-based reflexivity in criminological ethnography see Ball

¹⁰ The techniques of neutralization are divided into five categories: denial of responsibility; denial of injury; denial of the victim; condemnation of the condemners; and the appeal to higher loyalties (Sykes and Matza, 1957; Wyatt and Brisman, 2017).

2020), as a woman doing research in an almost exclusively masculine environment, I understand the necessity to briefly reflect on this fact. In Russia, outside of major cities, women generally fill very specific ‘house wife’ roles (e.g., raising children, looking after the house affairs and usually not working), something that is highlighted further in the rural regions I was working. I was frequently confronted with astonishment that I was a researcher, that I was ‘allowed’ to travel so far for work, and that I should be home, married with children. I am acutely aware that most participants were willing to talk to me *because* I am a woman; going even further, I do not believe a man would have had the same success acquiring the necessary information for this project. Participant behaviors and attitudes towards me ranged from astonishment to glee to curiosity at my presence. I believe these behaviors and feelings, coupled with the fact that I was as non-threatening as possible in my demeanor and behavior, engendered their overall openness with me. While I was at times uncomfortable and had to deflect personal questions and questions that were clearly patriarchal in nature, I never felt threatened. Having a Russian male driver, who did very well at disappearing into the background, most likely helped facilitate participants comfort to converse freely with a foreign woman, merely by his presence.

Discussion and conclusion

As time passed in the field, I became increasingly aware (thanks to confidential and trusted sources) that the FSB was trying to locate and interrogate me for the subject matter I was delving into and the sensitive information I was

uncovering. Deeply suspicious of foreign scientists, they did not want the information I was gathering on tiger poaching leaving the country. In many cases this information implicated those associated with the government, FSB and police service and shed light on Russia's systemic corruption and problematic wildlife conservation schemes (Skidmore 2021b, 2021c). From the onset of my research, I was aware that my research was not something the Russian government wanted disclosed publicly and I took numerous precautions. Every night I uploaded my data to the cloud and subsequently deleted all interview information, pictures of poached tigers and products, etc. My precautions were warranted because towards the end of my planned fieldwork, warnings from trusted sources increased in frequency and my interpreter and I were forced to "lay low". I was able to get my interpreter safely out of the region before I was eventually caught, questioned, and deported. Although my research materials were confiscated, due to the safeguards I took, my data remained intact, and my sources and participants remained secret. I would not recommend working in a region like the RFE unless you are well prepared, aware of the risks and take all necessary precautions to mitigate them. I stress again the importance of having a gatekeeper as an initial contact point who has deep knowledge of local nuances and networks.

Despite being ultimately deported from Russia, I do not think, overall, my methods posed significant risk to myself, my interpreter, or my participants. Before my field work, I thought the most significant risks would be direct, in the form of interviewing active criminals. What I discovered was despite the illegality of

poaching tigers, I never felt physically at risk with my participants. I was surprised at the ease which participants spoke to me. Similar to Van Uhm (2016), I found participants willing to talk about illegal business for numerous reasons, including that they were excited, even flattered to speak to me. In many cases they had never conversed with someone from the West and as I was a foreigner, an “outsider”, the information I acquired would be leaving with me. They also did not fear being caught due to the lack of enforcement. Tiger poaching was fully criminalized in 2013, but there is a significant difference between something being illegal and the law being enforced. In many cases enforcement officers were directly involved in the trade. My participants were further impressed that a young woman had the courage to investigate the illegal tiger trade and wanted to help me. They were proud of their business and wanted to brag, using neutralization techniques suggesting they did not believe they were doing anything wrong. I was also always clear and upfront with the anonymous nature of my research, that their identity would never be recorded, which aided in participants’ willingness to speak.

Quantitative methods remain an important tool in wildlife crime studies.

Customs seizure trends (Petrossian et al. 2016; Van Uhm 2016), the effect international wildlife commodity bans have on poaching (Lemieux and Clarke 2009), poacher preferences for illegal border crossings into protected areas (Van Doormaal et al. 2018), modeling the most efficient wildlife patrol regimes in protected areas (Fang et al., 2017), and modeling enforcement and compliance in conservation (Keane et al. 2008) have all been studied quantitatively. However, qualitative

methods provide a means to both complement and increase the robustness of existing natural science knowledge (Drury et al. 2011; Moreto 2016) and to concentrate emphasis on the contextual factors and details of crime commission.

In hopes that ethnographic methods will become more mainstream for collecting and analyzing wildlife crime data, this article sought to demonstrate how ethnography enabled me to do emergent research to achieve a study objective in a field dominated by the natural sciences. One of the limitations of qualitative methods is the findings lack generalizability. However, wildlife crime is unique to the location it is occurring in, the species in question, and the overarching socio-cultural nuances within the region that influence the everyday lives of individuals. Therefore, in terms of policy implications, preservation of context is crucial to identify ways to interrupt illegal wildlife supply chains within a particular setting.

Ethnography's ability to capture individual subjectivities and illuminate the lived experiences of participants make it one of the best ways to explore the periphery of both people and places. Because of this focus I was able to capture data about the individual motivations for why hunters poach tigers and what specific methods they employ (Skidmore 2021b, 2021c). I used mixed methods during the data analysis stage. After coding individual interviews, I was able to categorize motivation and method of poaching into groups to establish percentages, an admittedly quantitative presentation of results. For example, 23% of tiger poachers engage in poaching due to human/tiger conflict. This generalized percentage can be used for broad description or it can form a context for individual subjective quotes, as in the case of this hunter I

interviewed: “Many hunters do not like tigers and kill tigers because they take away their prey – they are competition.” I now have both individual, nuanced details about each participant and generalized, broader categories represented as percentages, giving me a variety of ways to discuss the dynamics of poaching tigers in the RFE.

My work builds on Drury et al. (2011)’s assertion that qualitative methods help provide internal validity when studying complicated and ambiguous concepts and contexts. Qualitative methods alone or in combination with mixed methods can advance understanding in human behavior in conservation contexts and provide an important complement to natural sciences. Besides individual subjectivities surrounding motivation and methods of poaching, I was able to use discrete interviews to map out illegal tiger supply chains by employing multi-sited ethnography. By directly interviewing poachers, middlemen, buyers, and smugglers, I used methods that focus on the contextual subtleties and the individual to collect data on a regional process, and in doing so I have data on both the micro and macro dynamics of this illegal trade. I am confident that the data I gathered could not have been acquired in any other way. I interviewed 116 individuals who belong to a poaching subculture crafted out of a remoteness, prolonged marginalization and a larger hunting culture. These individuals contributed varying amounts of information to help me piece together a picture of the motivations, methods, and extent of Amur tiger poaching in Russia.

Figure 1.1. Map of Russian Far East. Primorsky Krai, known locally as Primorye (location of study) is in orange.



Chapter 2

Amur tiger poaching in the Russian Far East: motivations fostering a poaching subculture

Abstract

The illegal wildlife trade is the most direct threat to the survival of many species. Gathering empirical evidence about the motivations associated with the poaching and trafficking of wildlife is crucial to combating it. The conservation of species susceptible to poaching is fundamentally about changing human behavior, which can only occur if we first understand the underlying motivations to poach. This study employs criminological ethnographic methods to uncover the nuances of Amur tiger poaching in the Russian Far East. By conducting interviews with those directly involved, the first empirical data about the motivations to poach Amur tigers is elucidated. 43 of 116 respondents (37%) admitted to involvement in poaching/trafficking; three main motivations were identified – ‘thrill/elite’ poaching, economic, and human/tiger conflict.

Introduction

The poaching and trafficking of wild animals constitutes the greatest threat to the continued existence of many species. The low-risk, high reward wildlife trade is becoming increasingly ubiquitous. Most empirical research that addresses wildlife crime derives from conservation biology studies, due to the field's focus on protecting biodiversity. Wildlife crime is inextricably linked to human behavior (Schultz 2011; Inskip et al. 2014) and the complex interface between human-natural systems; therefore, it is a socially embedded issue warranting an interdisciplinary approach to address threats (Moreto 2015). There is a growing body of literature that acknowledges how criminology, a field within both the behavioral and social sciences, has much to offer in understanding the human dimension of wildlife crime. This article adds to this literature by recognizing the value of a criminological perspective to advance our theoretical understanding of wildlife crime commission and methodological approaches to study it, with the goal of effectively mitigating threats.

For many large carnivores human-induced mortality presents the most significant threat to species' survival. The drivers of poaching are complex, nuanced, and context dependent (Inskip et al. 2014), although most scholars agree that the attitudes of local people toward carnivores are critical to understand, as they interact with contextually dependent socio-economic circumstances to determine behavior toward carnivores (Kühl et al. 2009). Carnivore conservation can succeed only if the

behaviors of who share their habitats changes for the better (Schultz 2011).

Identifying and understanding the factors that motivate poaching is a requisite first step for conservation interventions to be targeted appropriately (Keane et al. 2008; St John et al. 2010).

Tigers (*Panthera tigris*) are one of many carnivore species threatened by poaching. Despite international treaties of protection, tigers are one of the most exploited wildlife species, due in large part to the enduring domestic demand for traditional medicine in Asian countries, especially China (Moyle 2009; Wong 2016). The past 100 years has seen the global tiger population shrink from 100,000 to less than 3,500 individuals (Goodrich et al. 2015). Population declines are due to habitat loss and fragmentation, loss of prey base, human/tiger conflict and poaching for international trade. Studies have examined the last link of the poaching supply chain: the domestic markets in China (Moyle 2009; Wong 2016; Van Uhm 2016) and Nepal (Karmacharya et al. 2018). However, the first link, including the range of people involved, their motivations and associated links to the commercial trade, has rarely been examined. Studies in Bangladesh (Inskip et al. 2014; Saif et al. 2016), Indonesia (Shepherd and Magnus 2004), and Sumatra (Risdianto et al. 2016) stand out with this focus.

In Russia, filling in the knowledge gaps about tiger poaching is critical and time sensitive. Poaching has been identified as the most direct threat to the Amur subspecies (Robinson et al. 2015), however minimal empirical evidence exists about poacher motivation. The Russian Far East (RFE) is the last stronghold of the Amur

subspecies, with a population around 300 adults (Wildlife Conservation Society). The primary destination for tiger parts is across the border in China, yet even sophisticated transborder wildlife supply chains begin at the local level. Considering that fact, this study, the first detailed examination of the poaching and trafficking of Amur tigers, is focused on determining the specific drivers of poaching behavior. These results are part of a larger study that explores the entire illegal supply chain of tigers from Russia into China.

Kahler and Gore (2012) point out that most of the literature regarding the diversity of poaching motivations is predominantly speculative and general. They claim that this literature is not based on methodical inquiry about the self-defined motivations of those who are engaged in poaching, but researcher assumptions about motivations that are often built into study design in advance (e.g., poaching for commercial sale or household consumption) (Kahler and Gore 2012). Preconceived notions about why actors are poaching, especially by imposing artificial categories in quantitative questionnaire form, can significantly limit the ability to capture important details and nuances about this behavior (Drury et al. 2011). Qualitative criminology offers the requisite tools and perspectives to address this – to understand the array of behaviors locals have toward carnivores and their motivations to poach them.

This study aims to address the call for empirical data about poacher motivation. By utilizing criminological ethnographic methodology, I conducted interviews with those directly involved – the poachers, buyers, middlemen and smugglers – in tiger poaching to gain insider information about this wildlife crime.

This paper contributes to both conservation science and criminological literature by building on Balmford and Cowling's (2006: 692) notion that, "...conservation is primarily not about biology but about people and the choices they make"; as well as Schultz's (2011: 1080) claim that "...conservation is a goal that can *only* be achieved by changing behavior." In order to change behavior, we must first understand behavior, and the underlying drivers that manifest them. Duffy et al. (2016) emphasize that a greater emphasis on political, economic and social processes and contexts, both historical and contemporary, must be addressed in discussions about motivations to engage in poaching. This study seeks to give a detail examination of the underlying micro and macro mechanisms behind tiger poaching motivation in a remote and understudied region.

I begin with a historical overview of the RFE, an examination that will aid in understanding how the history of this region has influenced modern day poaching of tigers. An account of poaching motivation in the literature, and the proposed addition of a 'slippery slope' transition into poaching follow, and then a description of the methodology used to obtain the data for this study. The main findings about motivation of poachers are then presented. Discussion and conclusions follow.

The Legacy of *Perestroika*

The shaping of the modern RFE is framed by the abrupt and dramatic collapse of the seemingly irrevocable Soviet Union in 1991. The RFE, characterized by abundant, valuable natural resources, is also one of the most remote, impoverished and corrupt regions in Russia (Wyatt 2014). Historically, the region was almost exclusively resource-dependent; as an outlying region nine time zones away from the capital, it was locked into an enduring colonial type of economic relationship with European Russia and relied heavily on state subsidies and support (Bradshaw and Lynn 1998). Following *perestroika*, the formal restructuring of the Soviet Union's economic and political systems, the central government initiated an abrupt cessation of management, investment, government resources and industry, causing development in this region to not only stall, but regress.

The destabilization of the central state and hasty transition to a market economy and democratic state caused a breakdown of rural economies. In the RFE, many people lost jobs and access to services, such as education and health care, initiating a protracted socio-economic crisis (Kuhrt 2012). Structural asymmetries due to a breakdown of a functioning government marginalized the population, as without the state managing essential services the region failed to maintain basic social and economic infrastructure (Poelzer 1995; Newell and Henry 2017). Privatization of state-owned companies in the absence of a credible regulatory regime led to a criminalization of the economy (Passas 2000). Increased crime, capital flight, emigration, and poverty became embedded systematically in society.

The devolution of the central state also eroded legitimacy within environmental state agencies, causing the deinstitutionalization of environmental regulation (Mol 2009) and the cessation of natural resource protection efforts. The disparity that exists between Russia's formal environmental laws and state agency capacity and interest in enforcing them, has caused scholars to define the illegal harvest of natural resources as Russia's most persistent and intractable environment challenge (Newell and Henry 2017). *Perestroika* opened the border with China, leading to an influx of Chinese citizens offering money and basic necessities for trade opportunities of the RFE's natural resources (Braden 2014). The resultant confusion, corruption and ineffectiveness of natural resource policies coupled with open international borders and high external demand caused significant increases in exploitation pressure on valuable wildlife and other natural resources (e.g. timber and ginseng).

In the RFE, the result of these events was an increasingly self-sufficient population and the rise of an informal shadow economy that many came to rely on in lieu of the government (Kuhrt 2012). This informal economy flourished. Similar to legal and state-controlled economic operations, informal and illegal economies in the RFE formed networks of mutual aid, reciprocity and cooperation (Holzlehner 2006). A side effect of this informal economy has been the subsequent rise of a subculture that fosters endemic corruption and the sustained illegal harvest of the region's natural resources. As Stoecker and Shakirova (2013) point out, "Russian society has an inherent system of commonplace norms and values that allow for the inclusion of

corrupt practices into everyday business. That system is respected and accepted on par with formalized laws.” An overt promotion of principles that legitimize corruption have become so embedded in Russian society and they are often inseparable from daily socio-economic relations. Corruption has become increasingly routine, causing a generalized belief that nothing will get done *without* corrupt practices (Stoecker and Shakirova, 2013). This systemic divergence from legitimacy is even more pronounced in the RFE, where the region has been left to fend for itself. In summary, the RFE has specific characteristics that make it especially vulnerable to poaching: remoteness, poverty and unemployment, abundant natural resources that are poorly managed and monitored, high external demand, backwards bureaucratic processes, high levels of corruption, and a society of obligatory self-sufficiency.

Complex drivers of poaching

People poach for a variety of reasons that combine specific individual agency and motivation, as well as broad social, economic, and political drivers (Duffy et al. 2016). Although typologies of specific poaching motivations have been recognized (Muth and Bove 1998; Eliason 2004), the evidence demonstrates that poaching is a complex phenomenon due to the diverse economic, geographic, social, and psychological contexts in which it occurs (Kahler and Gore 2012).

Economic poverty has received a comparatively large amount of attention as a driver of poaching (Nellemann et al. 2014), with individuals illegally killing wildlife for personal consumption or to sell highly valued wildlife parts. Poverty as a driver

has been explained with emphasis on the micro level – the agency of individuals. This is based on the theory of rational choice, emphasizing how people will maximize their utility by evaluating the risk and reward of performing a specific act/behavior with the information available to them (Ostrom 2010). Globally, the risks (i.e. jail time, fines) associated with poaching are comparatively low to other forms of illegal trafficking. A lack of strong deterrence may influence the decisions of individuals to poach. Poverty as a driver has also been explained at the macro level – with emphasis on structural explanations in a broader context. While economic poverty may encourage people to poach high value species on an individual level, such poverty can only become a driver if there is market for the contraband – i.e., international demand (Challender and Macmillan 2014; Duffy et al. 2016).

While the accepted definition of poverty is largely an economic one, its origins and effects are much more nuanced than material deprivation. Poverty can be multicausal and encompass lack or loss of identity or status, culture, customs, prestige, personal expression, power and the ability to decide one’s own future – all difficult measures to reliably quantify (Sen 1999). If poverty reduction schemes focus strictly on economic incentives, this assumes, for example, that market forces will protect the environment (Duffy et al. 2016). If one operates under the assumption that economic poverty is the root cause of poaching, then the problem can be alleviated by providing paid employment and/or ‘alternative livelihoods.’ However, this idea can falter when it does not take into consideration multidimensional poverty. For example, the IUCN began a program to halt declining ibex populations by

implementing an international hunting trophy scheme, requiring locals to stop their historic and cultural hunting of ibex. The scheme failed because hunting was a source of prestige and status and selling trophy permits to wealthy international hunters did not remove all the incentives to hunt (MacDonald 2005).

Other important drivers of poaching are reducing costs incurred from large carnivores, including livestock loss (Zabel and Holm-Müller, 2008; Carter et al., 2017) and emotional cost related to fear of human and/or domestic animal fatalities (Flykt et al. 2013). ‘Thrill killing’, where poaching does not occur from necessity but from the adrenaline and fun of the illegal act has been identified (Muth and Bowe 1998; von Essen et al. 2014). Forsyth and Marchese (1993b) documented how the excitement and adventure offer benefits that compensate for the risks involved in crime commission. Studies have demonstrated the use of neutralization techniques to rationalize behavior and relieve cognitive dissonance, enabling poachers to engage in wildlife crime without developing a guilty conscience (Eliason and Dodder 1999).

Studies have found evidence of Sutherland’s (1939) differential association theory and contend that individuals who poach learn how from intimate social ties such as close friends and family. Basic beliefs about poaching are formed early in life (Curcione 1992) and are culturally determined with both the technique of poaching and the ability to justify these acts acquired socially (Forsyth and Marchese 1993b; Eliason 2004). Normative compliance theory helps elucidate compliance with conservation laws by describing how people adhere to the laws and rules implemented by authorities only perceived to be legitimate (Kuperan and Sutinen

1998). This includes individual belief about what is morally right and wrong and collective beliefs as a society about what is acceptable behavior can determine whether rules are followed, independent of the legality of an act (St John et al. 2010). In this way, poaching has been witnessed as an acceptable act of social defiance against conservation laws perceived as illegitimate or culturally oppressive and can even be community sanctioned (Eliason 2012; von Essen et al., 2014).

One perspective on poaching that may not be addressed in the literature has to do with the concept of a ‘slippery-slope’ of declining resistance to major poaching resulting from successful minor infractions. Based on this idea, hunters transition from the relatively minor violation of poaching legal game, usually for household consumption, to endangered wildlife that is purely profit driven and a much more severe form of law-breaking. I have observed behaviors consistent with this perspective both in Africa and the RFE. This slippery-slope perspective, which can be seen as an offshoot of the rational behavior model, is evaluated below when considering evidence of poacher motivation.

Methods

In the RFE 80% of the Amur tiger range is within the Primorye region, which was selected as my study location. I collected primary data from the first-hand accounts of the individuals who are directly involved in the illegal tiger trade (e.g. poachers, middlemen, buyers and smugglers). Data collection occurred over 16 weeks spanning two separate trips: January-February 2019 and January-March 2020.

I visited 14 distinct locations and covered approximately 7000 kilometers by car. An IRB application was required before the commencement of the research (University of California Santa Cruz IRB # HS3434). I obtained a scientific exchange visa to conduct in-country research legally under Russian law.

As described in Skidmore (2021a) I utilized qualitative methods for this research. Qualitative methodology is appropriate when statistical generalizations are not the goal, but rather a thick, rich exploration of a topic, coupled with the preservation of context, is the objective. Multi-sited ethnography, which enables a researcher to gain a deep and grounded understanding of a particular cultural or social phenomenon, was my chosen methodology (Van Uhm 2016; Siegel 2009). During multi-sited ethnography, the researcher follows the subject of inquiry, in my case, the illegal tiger trade, along its entire route (Marcus 1995; Van Uhm 2016). This exploratory study necessitated a grounded theory approach, as there was little empirical evidence to frame my research. Grounded theory, involving the development of hypotheses and theories through the ongoing collection and analysis of data in the field, necessitates an inductive research process. Due to this focus, letting the data guide the research in the field, ethnography works well with grounded theory (Charmaz 2006).

With goals to identify poaching motivation and to develop context-specific intervention measures, ethnographic methods were selected for numerous reasons: (1) ethnography is considered one of the best methods to use when virtually no empirical data exist (Moreto 2017); (2) ethnography is well suited to expose the layered

complexity and variability of wildlife crime, where there exists large disparities between settings, drivers, species in demand, and individuals involved; (3) ethnography has demonstrated great potential to contribute to theory (Hochstetler and Copes 2016); (4) and due to its ability to capture context-specificity, ethnography can help identifying ways to interrupt illegal wildlife supply chains within a particular setting.

Ethnography allows for an interpretive and immersive research process by letting respondents depict their social world in complete detail (Eliason 2004). Structured questionnaires, frequently used in quantitative studies, impose categories on questions that are a reflection of the researcher's own bias and ideology, and also constrain responses (Hochstetler and Copes 2016; Drury et al., 2010). This paper follows Eliason's (2004; 2012) and Forsyth and Marckese's (1993a; 1999b) approach of emphasizing findings with informant quotes – enabling respondents speak for themselves. Additional coding and quantification of categories of motivations help provide emphasis to the most common motivations revealed.

Purposive sampling, a type of nonprobability sampling, was utilized. Respondents were chosen subjectively based on specific characteristics rather than being representative of the entire population (Bernard 2011). Initial introductions, facilitated by a confidential gatekeeper, led to a snowball sampling method, where future respondents were recruited among acquaintances of initial respondents. The strength of this approach is that it increases the number of highly qualified respondents one can reach in a finite amount of time and with limited budget. It also

was selected because it enables the researcher to focus on hidden or reluctant populations and/or those participating in illegal activities (Cohen and Arieli 2011). By working through networks using the snowball sampling method, one can collect detailed descriptions of choices and behavior as demonstrated by the quotes listed below. The weakness, compared to probability sampling, is it is more difficult to generalize findings through statistical inference.

When illegal behavior necessitates sensitive questions, researchers can build rapport and trust with qualitative methods that are less structured and focus on immersion and interaction with the respondents (Puri 2010). Participant observations and semi-structured interviews allow for this and were my chosen methods. These methods allowed me to focus on the comfort and security of my respondents, due to the sensitive and clandestine nature of the topic, and gain their trust by participating in sociocultural norms and activities (e.g. meal sharing, going to the sauna, going in the taiga on snowmobiles/skis and drinking vodka). Participation in such activities was essential to gain trust. These methods are also unstructured in the sense that I had to follow the routine and activities of my respondents – rather than imposing my schedule on them. This aided in making our conversations more natural, increasing respondents' willingness to share information.

Respondents had complete anonymity – no interviews were recorded, and no identifying names or characteristics were documented. References to specific towns have been removed. All respondents provided verbal informed consent. Interviews and field notes were transcribed every night into my computer. As a precaution, all

data, including interviews and pictures, were saved to the cloud and then deleted from the computer's hard drive every night.

116 respondents were interviewed; these talks ranged from quick discussions that lasted 30 minutes to multiple-day informal conversations that also incorporated hours of participant observations and spending the night in accommodations provided by the respondent. Conversations varied from one-on-one talks to group-setting discussions, including conversations over a meal or excursions into the taiga. 43 of 116 respondents (37%) admitted to being directly involved in the poaching and/or trafficking of tigers. Data were analyzed using Nvivo and coded for themes following Saldaña (2009). Example of coding frequency can be seen in Table 2.1.

Results

Three general categories of motivation were identified: elite killing, poverty, human-tiger conflict, as well as an overarching belief that everyone will kill a tiger if they have the opportunity. These categories are not mutually exclusive, as a single poacher may have multiple motivations. I categorized them based on their self-defined primary motivation. The verbatim quotes included are from all respondents. Due to the strong community ties, even if an informant was part of the non-poaching category, they almost always knew who the poachers were in their village and information about this activity. This information was included when relevant. Quotes below are from individual respondents, with no one quoted more than once.

Elite Killing (n=5 or 16% of poachers): Elite killing of tigers highlights the division of power, influence and wealth in the RFE. It is a demonstration of power through impunity, described as ‘VIP illegal hunting’ in Braden’s (2014) work on poaching in Russia. Many of these poachers are wealthy or connected individuals who are insulated from the law in some capacity. They do not poach out of income deprivation, but because they can, and because the system protects them. These people include those in FSB (Russian secret security), the police force, those in specific government positions, and people with connections to those in power. Motivation for these actors is less about profit and driven more by status and a recognition of their impunity and power. Killing of tigers is done for the thrill of it; often elite poachers do not even sell tigers they kill. Following are some examples from respondents:

“I have poached about ten tigers in my hunting career. I have two sons in the FSB. So, who will stop me?”

“...here (name of town removed) a few people hunt for money, but most are police who shoot tigers for fun.”

“Here, in (name of town removed), the corruption is so bad that when the head inspector went to his boss in Vladivostok to ask to fire staff because they were poaching – he was told to leave the matter alone.”

“The police shoot tigers here – no one can stop them. They don’t even sell them.”

“A buyer here used to be a police officer. He buys illegal goods from everyone. He doesn’t need to follow the law.”

Respondents openly discussed how they would not be able to be in the ‘tiger business’ if they did not have connections within the government and/or police force, demonstrating the embedded corruption. This concurs with an implicit consensus among Russian citizens that ‘connections’ are the most important aspect of getting ahead in a career or just getting a task accomplished (Kofanova and Petukhov 2006).

Some examples of this:

“Yes, the government and police know about the tiger poaching – of course. The people up top are getting money from this. If I weren’t talking to people in the government, I wouldn’t be able to be a buyer.”

“I work with many members of the government and police because of the connections – without that I would not be able to do what I do.”

A powerful group of individuals, with ties to the central government in Moscow and access to a significant amount of government and international NGO tiger conservation funding are pushing to legalize trophy hunting for tigers. A respondent told me: “Yes, I support the legal tiger trophy hunting proposed by them (name removed).” In 2020 canned hunting, the trophy hunting of animals that are drugged, incapacitated or unable to escape an enclosed area, was legalized in Russia for game species (Federal Law of February 18, 2020 N 26-FZ). The legislation was pushed through by these same individuals who are lobbying for tiger trophy hunting. Disturbingly, this push to legalize tiger trophy hunting was referenced by multiple respondents.

Poverty: (n=19 or 61% of poachers): This type of poaching is driven by economic deprivation and/or cultural/spiritual poverty. Economic deprivation is the largest contributing factor in this category, with unemployment cited frequently. In a region plagued by chronic unemployment, subsistence hunting is critical for survival and wildlife is hunted for nutrition and for fur to sell. However, multiple factors have affected the sustainability of hunting and thus the livelihoods of many. The prices on all animal products have dropped significantly. For example, sable fur more than halved in value in just a few years: from 6000 rubles (~\$76) per pelt in 2013/2014 to 500-3000 rubles (~\$7-\$38), depending on quality and sex, in 2020. This drop in price is linked to a decrease in international demand, as fur has fallen out of fashion due to more ethical shopping practices by consumers. As one buyer expressed to me:

“Nowadays, there was a recent auction, and a female sable cost 500 rubles. And why would I go there as a hunter? Why would I sell this poor animal for that kind of money? The sable was the jewel of Russia, but now, I don’t know why. Maybe sanctions from Canada, but the market is a market, and it is down.”

This downward trend in the market has had a significant impact on hunters, as sable hunting for many was a primary source of income. With sable prices below a livable wage, hunters have transitioned to hunting more profitable animals for international markets, like musk deer and tiger. Without many alternatives, hunters will adapt to kill what is valuable – regardless of the legality. Below are some examples of this:

“Sables are no longer worth anything, and the licenses for other animals are unaffordable, so hunters have turned to poaching, usually musk deer – there’s always demand for that.”

“Sable prices have dropped dramatically causing hunters to go after other animals.”

“What I’m going to say is that 95% of the hunters in this area will kill a tiger if they see one. Because it’s money. People don’t have jobs and they need to feed their families, so unfortunately most of them will kill a tiger.”

“Unemployment drives poaching – there are no jobs here. You can get 350,000 rubles (~\$4800) for a tiger. Such money will sustain you for a long time.”

“So now people are looking for other sources to sustain themselves, and this obviously includes poaching. Yes, this includes tiger poaching.”

“Hunting is no longer a sustainable livelihood for the people here. Back in the day hunters lived, now they just manage to survive.”

“Yes I am dealing in illegal musk deer and tiger – there is always a demand for this. Especially the bones and canines (of a tiger). I will give a hunter 70,000 rubles (~\$1000) for male canines. I can get three times that amount from the Chinese”

“People poach tigers because of the demand in China – we all know those tigers are worth something.”

“Musk deer are absolutely poached, it’s a money game. One set of glands is worth 30,000 rubles (~\$400). Most regions you can’t even get a license for musk deer, so hunters just shoot whenever they see one.”

Over the past decade, many hunting concessions have become privatized by the wealthy elite – primarily people from Moscow. This has upset rural villagers who view the taiga as a common resource, as there is a long history of equal public access to hunting ground dating back to the 1917 Revolution (Braden 2014). New

regulations, established in 2012, have led to the infringement of the rights of hunters who have hunted in the same areas for many generations (Braden 2014). Hunters are required to buy a license for a specific animal from the manager of the hunting concession where they wish to hunt. These licenses have become unaffordable because the prices have been driven up due to many hunting concessions being bought and privatized. Anti-government sentiments and anger/lack of acceptance over modern environmental and hunting laws incentivizes poaching. This rapid privatization of former common land has given hunters various motivations to poach, including: economic poverty, overpriced licenses, prices on legal game have declined, and cultural poverty/the infringement of a traditional way of life. Below are some quotes that highlight this, and the use of neutralization techniques, including ignorance of the law and lack of respect for corrupt authority/government and unjust regulations:

“There is a lack in understanding on what is legal or illegal – the government does what they want. We can’t keep up with the laws changing.”

“Who are they to take the taiga away from us?”

“Poaching – it’s money, feeding your family. In Russia, the government was formed in a way that doesn’t let people live. They don’t care that we need to make some sort of small revenue, they won’t fund any small factories that could make jobs or anything, since the government can’t benefit from it.”

“The taiga has changed so much – now wealthy people from Moscow own it.”

“I opened up a small supermarket, and I had a few stores around here and I had a salmon business. And then in 2003 the leadership in

government changed, and they taxed us so much they caused every business to go bankrupt in this area. If you make even a small profit the government taxes you heavily and it bankrupts you. I make money illegally now. I buy tigers and other Red Book animals” (Red Book animals are those listed on Russia’s endangered species list and illegal to kill).

Due to the changes in regulation and the uneven and discriminating way licenses are sold – as the high cost of licenses make them unaffordable to most rural hunters – many hunters chose to simply sell their products illegally to a buyer. As tigers are always illegal to sell, these quotes below reference other animals. However, it is important to note that these quotes help characterize the thriving shadow economy in the RFE. The society here fosters the practice of buying and selling illegal wildlife.

“Now if you sell to an illegal buyer, and there’s a lot of them here (name of town removed), you get an even higher price.”

“Hunters will get three times the price from an illegal buyer.”

“If someone hunts without a license and gets the bear paws, that’s illegal, but the blame is on the hunter, not the buyer. It doesn’t concern me how something was hunted; I’m just trying to get some revenue to feed my family.”

There is a strong sense of social bonds between hunters. Hunters spend the winter months in the taiga in huts together, without returning home often, forming social ties on par with traditional families. These hunters, who hunt using traditions passed down from their fathers, also hunt in a manner reflective of the group dynamic they belong to. Whether or not a group decides to engage in poaching, be it a sable or

tiger, is a collective undertaking; loyalty is strong, and law-breaking behavior is not shared with authorities.

“Only hunters with connections will be able to sell a tiger. It depends on who your friends are.”

“A few years ago, we were all hunting in the taiga. We came upon a tiger. We killed it and sold it for 350,000 rubles (\$4500) – we split this between all seven of us.’

“A local buyer will pay us for the GPS coordinates of tiger tracks if we come across them when hunting in the taiga.”

I came across multiple cases where rangers, who are tasked with wildlife protection, are responsible for tiger poaching. These rangers, who work for either the government in a National Park or *Zapovednik* or for a private company to assist on hunting concessions, are in a good position to poach without repercussions. They know about tiger locations, come into direct contact with tigers often, and usually have positions of power insulated from suspicion. I learned a ranger was caught with two tigers in his freezer. His superior, a man who is in a position of power within the National Parks system and has direct connections to the central government and FSB, facilitated acquitting him of conviction. This is an example of motivation overlap. Poaching by this ranger was probably driven by economic motivation, as rangers earn on average \$230-\$350 per month, as well as the ranger being in a protected position – he knew he could get away with poaching if caught. A respondent told me: “The inspectors (rangers) get paid so poorly, so poorly. It is bad! I do not know one that is not corrupt in some way or another.”

Human/tiger conflict (n=7 or 23% of poachers): Human/tiger conflict, accounting for nearly a quarter of poaching, includes retaliatory killing for a tiger killing livestock, humans, or dogs, as well as hunters killing tigers they view as competitors for prey species. There has been a steady increase in tigers coming into villages in Primorye. This trend appears linked to a reduction of the prey base for the tigers. Boars are the main food source for tigers and an outbreak of African swine fever is having devastating impacts on the boar population. Also, illegal logging, an incessant threat in the RFE, is increasing rates of human/tiger interactions. 50-80% of the logging in this region is illegal; 96% of trees harvested are destined for China (Environmental Investigation Agency 2013). This environmental crime is degrading habitat for both tigers and their prey. Illegal logging in this region is usually selective and removes the largest Mongolian oak and Korean pine trees. These trees produce nuts and acorns, which are the main food source for boar and deer. A reduction in food for these species is causing a reduction in their population – thus affecting the amount of prey available for tigers. Cumulatively, these factors are driving tigers into villages with increasing frequency and human/tiger interactions are increasing – to the ire of villagers. Below are some responses from respondents highlighting this:

“Illegal logging is everywhere around here. Tigers are being forced out of their territory from excessive logging, and that’s the main reason of them coming into a village and killing someone.”

“Tigers don’t have anything to eat, hunting boars has become hard, it’s easier to wander into a village and catch a stray dog or cat.”

“The boar virus from China will increase conflicts with tigers more – there is no prey.”

When tigers come too close to villages, they are often killed by hunters who use self-defense, preventive defense or defense of livestock/domestic animals as a justification (regardless if the tiger has killed anything). Some examples:

“They killed our livestock. They were problem tigers.”

“Tigers have killed many of my dogs – I have gone through so many dogs!”

“Villagers kill tigers for safety and because they kill our dogs.”

Motivations for poaching are not always straightforward or singular. Even if motivation for killing tigers is primarily due to human/tiger conflict, those that do kill tigers for that reason, know that their parts are valuable. After these tigers are killed out of conflict, they usually end up in the illegal trade. It is difficult to discern whether tigers in these instances are, in fact, being killed primarily due to anger/fear/retaliation or if those reasons are merely justifications for killing a tiger to sell the parts. Some examples:

“...of course that means run-ins (with tigers) have increased – which increases poaching rates – people know they are valuable. Even if they do not go into the taiga looking for a tiger, if one comes into town, that tiger will be targeted.”

“He sold the bones sold when a tiger was killed in self-defense.”

“I sold the bones of one tiger after I killed it for attacking my dog. I got \$4000 for it.”

“And if there are strict laws and punishments, people are still going to protect themselves if a tiger enters their village. If anyone wants to sell

the parts after, they will, that won't go away. They know those tigers are valuable. What do people here have to lose?"

These responses demonstrate the complex and multi-dimensional manner that poaching can take on – that it need not be based on a single motivation. Tigers are also persecuted because they are viewed as direct competition with hunters for prey species. Prey species have declined overall throughout the region, due primarily to poaching and illegal logging, but hunters blame prey reduction on tigers. Responses citing conflict due to competition with hunters:

“Many hunters do not like tigers because they kill deer.”

“All hunters are passionately against tigers.”

“Hunters poach tigers due to competition. They kill all the boar.”

“I am a hunter – I have absolutely no positive outlook on tigers, nor does anyone else I know.”

‘Everyone will kill a tiger if they see one’

Irrespective of motive, almost every single respondent admitted that even if they had never killed a tiger, they would, if the chance presented itself, implying that a lot of tiger poaching comes down to opportunity. “Everyone will kill a tiger if they see one” was a frequently repeated sentiment. There are very few locals with positive outlooks on tigers: at best they are thought of neutrally; at worst, as dangerous pests/competitors, or just an opportunity to make money. Regardless if an informant had poached themselves, they almost always knew someone who had, and did not

look down on this behavior – it was not stigmatized. The impression I got from the communities I visited was that they would not turn in someone they knew had poached a tiger from their village. Frequently cited reasons for this behavior included: protecting each other out of a sense of tight knit community – an ‘us’ vs ‘them’ mentality; killing a tiger was not a taboo behavior; disillusionment with law enforcement due to their well-known involvement in poaching; and an overall lack of respect for government regulations and enforcement protocol.

Tigers entering villages on a more regular basis was a frequently expressed concern. With illegal logging on the rise, this trend can be expected to get worse. Further, the extensive network of logging roads has created points of entry into the wilderness and the primary method that poachers gain opportunity to kill tigers (Skidmore, 2021c). Knowledge about the economic value of a tiger is well known. Saif et al. (2015) found that in Bangladesh a main source of tiger parts in the illegal market were from tigers that had come into villages and were subsequently killed by local residents. A similar trend is happening in the RFE: tigers are poached on the premise that they are a threat to people with the ulterior motive of selling the parts. This mode of tiger poaching could get worse with increasing instances of tigers coming into human settlements.

Most research on explanatory models for poaching operate on an individual level (Bell et al. 2007), including Eliason’s (2004) influential neutralization theory model. I found evidence for some of these neutralization techniques including: the condemnation of the condemners (i.e., law enforcement officers are

hypocrites/corrupt); the appeal to higher loyalties (i.e., loyalty to family and close friends comes before society); the denial of the necessity of the law (i.e., individuals feel regulations are not fair and they have been marginalized); and the defense of necessity (i.e., breaking the law is ok when necessary). However, my findings suggest that individual level explanations fail to completely explain patterns of poaching that are as pervasive, incessant and systemic as seen in the RFE. The strength of social ties and interaction among hunters and poachers contributes evidence to Sutherland's (1939) differential association theory, where poaching behavior is perpetual and self-reinforcing based on social ties, established norms and peer interaction. Similar to Forsyth and Marchese (1993b) I found evidence that close social ties serve as examples for justifications of and facilitators for poaching activities.

Discussion

Two distinct types of poachers were identified: the rural poor who poach tigers out of human/tiger conflict and/or monetary incentive, and the elite violators who poach out of impunity. With respect to the first category, in general, these people are traditional hunters who have transitioned into poaching legal game and/or tigers. With respect to the later there appears to be little motivation beyond a thrill.

Poaching as subculture of the rural poor

Based on my interview data, depending on the size and sex of the tiger, with large males worth the most, a hunter can expect to receive between \$3300-\$5000 for an entire tiger carcass and a buyer will be able to sell that to a Chinese middleman for

about \$8000. This price is considerable incentive for locals without steady income nor much to lose. It was clear during interviews that most local buyers purchase legal and illegal goods from hunters; therefore, hunters who kill a tiger generally already know who to sell it to, which further incentivizes this behavior, as they can quickly get rid of a 'hot' product. Economic deprivation coupled with tight social ties/social networks appears to be the strongest driver of whether or not an individual or group of individuals will engage in poaching behavior.

Levi (1981) concluded that offenders are generally not social introverts or outcasts and that criminal lifestyles are connected with local economies, often reflecting the activities of informal or black markets. Criminal identities become nested in the subculture society in which they develop and occur. This study lends further support to this idea. The reliance on an informal economy and the criminalization of vast aspects of society after *perestroika* has created systems of behaviors, values, and societal norms that support various forms of criminal conduct and endemic corruption, generating a systemic subculture that fosters poaching as an acceptable behavior. The results of this research add evidence to Muth and Bowe's (1998: 10) findings referencing the cultural nature of poaching, where they write: "Poaching often is embedded in subcultural webs of meaning that involve tradition, ethnic heritage, individual and social identities, and other socio-cultural factors."

Poaching in the RFE is a reflection and perpetuation of the subculture, emphasizing how individual behavioral choices do not occur in social vacuums but are inextricably linked to broader social and structural contexts. Normative behavior

dominates; individuals do not necessarily follow the rules and laws of society, but rather adhere to local values and beliefs on what is deemed morally right and wrong. Similar to perspectives found in the work of Muth and Bowe (1998) and Bell et al. (2007), poachers in the RFE are social actors, with group solidarity forming an important component of poaching behavior. Peer group norms dominate. Loyalty is strong between groups of hunters who form familial-like ties. If an individual of the group, or the group as a unit, engages in poaching, secrecy is guaranteed, reinforcing the idea that loyalty to community is stronger than adherence to rule of law and government. This type of social bond has been demonstrated in other studies related to carnivore poaching (Treves and Bruskotter 2014).

The residents of rural hunting communities do not perceive the privatization of hunting concessions and subsequent monopolization of poaching licenses as legitimate. Since hunting is both a traditional part of Russian cultural as well as a necessity due to unemployment, poaching could be representative of a backlash against the new regulations, which are deteriorating a way of life, economically and socially. Poaching could also just be out of absolute necessity for fear of starvation, without any political or larger scale motivation. The behavior could also be representative of a combination of both. It is apparent that cultural supports and belief systems continue to reinforce and perpetuate poaching behavior. Forsyth and Marckese (1993a) describe how this type of subculture behavior arises from state governing structures failing their citizenry. The collapse of cohesive governing structures, including environmental regulation, has seen poaching emerge as a

subculture phenomenon. This behavior is a result of linkages between mutually reinforcing emotional drivers on an individual level and cultural drivers on a societal level.

In the RFE, a culture with deep ties to traditional hunting has transitioned into a society where there is wide acceptance of poaching behavior for game species as well as high value wildlife (e.g. tigers and musk deer). All forms of poaching appear to be an entrenched part of the subculture. Many respondents who did not admit to tiger poaching still readily admitted to poaching other animals like sable, bear, and deer. What is evident is that in many cases individuals have transitioned from poaching legal game (e.g., taking beyond allowed take limits specified in licenses) for household consumption or to sell, to taking tigers, a purely profit-driven behavior. In this way, poaching of other animals, like deer and sable, can be seen as a ‘gateway’ or ‘slippery-slope’ to poaching more endangered and protected wildlife, such as tigers. This lends evidence to a slippery-slope perspective, where poaching game that is legal to hunt appears to evolve into poaching illegal wildlife based on opportunity.

The influence of corruption on elite poaching

Kofanova and Petukhov’s (2006) survey on public opinion on corruption in Russia describes how people believe that law enforcement is the group most susceptible to corruption, but at the same time are the very agencies tasked with fighting it. Overall, Russian society is firmly convinced that corruption is total and that it has infiltrated all spheres of public life. This belief is leading to a dangerous

erosion of the moral climate in society. Passas (2000) references this condition in Russian society as a condition of societal anomie: a breakdown of shared societal standards or values that bind community and regulate behavior, the absence of which cause chronic and self-perpetuating instability. A society that has become inseparable from corruption has engendered a subculture of patterned and normalized deviance, so that for many people, not only is there no real boundary between lawful and unlawful actions, there is, in fact, a tendency to think of their unlawful actions as status quo.

One form of corruption, elite poaching, is a particularly ominous behavior, as the repercussions are far-reaching. Braden (2014: 476) argues in Russia, elite poaching "... sets a destructive tone not only because of direct damage to wildlife sustainability, but also because it contributes to corruption of inspectors and prosecution personnel, cynicism about rule of law, and a discouragement to non-elite hunters, who are increasingly cut off from prey due to regulations and higher costs." Elite poaching, while not a large percentage of poaching behavior overall, has a disproportionate impact on perpetuating illegal behavior, as it breeds contempt for the law and fosters endemic corruption. The informant who admitted to poaching 10 tigers in his life, protected from prosecution due to his connection with the FSB, provides a stark example. In a remaining population of less than 500, 10 is a troubling number for one poacher to take. This example highlights how one person, and a relatively small group of individuals, can have a considerable impact. As the government and police force are supposed to be tasked with the protection of tigers,

the number of instances of poaching that involved a member of one of these groups engenders further disregard for the laws protecting tigers and broader societal contempt for regulators and regulations.

Discussion and policy implications

There is strong evidence that economic motivators are the ultimate driving force behind tiger poaching. Community ties, social interactions and the culture of corruption are also critical details to consider. Kühl et al. (2009) argue that in order to successfully implement community-based anti-poaching projects, local communities must value the resource highly. Currently, the situation in the RFE does not show promise for this, as most of the residents within these rural communities do not have positive outlooks about tigers. Conservation, when threatened by poaching, is not about biology as much as it is about human behavior, and the decisions people make (Balmford and Cowling 2006). Any conservation initiatives must prioritize reducing human-induced mortality of tigers and this equates to changing human behavior. The attitudes towards tigers in the RFE must change if these tigers are to persist. Schultz (2011) emphasizes that motivation is the impetus behind behavior change. There is evidence that explicit economic incentives increase tolerance for large carnivores in different regions (Maji et al. 2011, Lindsey et al. 2013, Treves and Bruskotter 2014).

Ecotourism is incredibly rare in the RFE but is beginning to show small progress in some regions including the Land of the Leopard National Park and Durminskoye reserve in Khabarovsk Krai. Ecotourism, when done properly, can

bring substantial benefits to local communities. I have visited Durminskoye reserve, a fledgling ecotourism project. The operation is still very small, but the appeal is strong and there are positive reviews from those who have visited. With successful marketing, this type of project can be upscaled and can be a tool for both development and conservation.

Other countries have had success with the conservation of large felids by appealing to the pride and heritage of the locals. The people of the RFE define themselves based on being separate from the rest of Russia – they harbor strong beliefs about their adaptability, resilience, and ability to survive. By appealing to their innate pride, the tiger could be marketed as a powerful metaphor for their own character and fortitude, something that has been done successfully with jaguars in Argentina (Caruso and Pérez 2013).

Another approach involves providing economic incentives for locals to get paid for actively conserving tiger populations. An international NGO could fund the placement of camera traps, where local communities would get paid for proof (GPS location and time stamp) of a tiger remaining in their region over time. As a community, by directly receiving benefits from tiger presence, the incentives would be high to prevent poaching.

Finally, considering that logging roads are the main way in which poachers gain access to the taiga, increasing their chance to encounter and poach tigers, incentivizing the restoration of these areas could be multi-beneficial. Many of these

roads are abandoned after logging has taken place, but the impacts of poaching are long-term. If unemployed locals could be paid by the government or an NGO to reforest these areas with native species, it would serve three purposes: provide paid employment to locals; bolster the native tree population, thereby helping to increase tiger prey species and reduce human/tiger conflict in villages; and help reduce access to the taiga, which would in turn reduce poaching opportunities.

Table 2.1 Breakdown of coding themes by frequency

Referenced item/theme	Coding frequency (#) out of 116 interviews	Example of participant’s statements
Equipment		
Heat-vision goggles	16	“Access to roads is how people kill tigers. They drive around at night until they see a tiger.”
spotlights	14	“We spotlight tigers from the road and night and shoot from the truck”
Camera trap	2	“Camera traps are used to learn the movements of the tigers.”
GPS	5	“A local buyer will pay us for the GPS coordinates of tiger tracks if we come across them when hunting in the taiga.”
Poaching process		
Use of roads	34	“Logging roads make the taiga more accessible, hunting is much easier.”
Mention of winter	7	“Most tigers are killed in the winter. Poaching is easier then.”
Motivation for poaching total: Broken down into:	31	
Elite “thrill” killing	5	“I have poached about ten tigers in my hunting career. I have two sons in the FSB. So, who will stop me?”
Poverty	19	“Unemployment drives poaching – there are no jobs here. You can get 350,000 rubles (~\$4800) for a tiger. Such money will sustain you for a long time.”
Human/tiger conflict	7	“I sold the bones of one tiger after I killed it for attacking my dog. I got \$4000 for it.”
Theme		
Corruption, in general	27	“Yes, the government and police know about the tiger poaching – of course. The people up top are getting money from this. If I weren’t talking to people in the government, I wouldn’t be able to be a buyer.”
Specific mention of FSB	21	
Specific mention of police	20	
Specific mention of government	14	
Chinese involvement in trade	33	“The Chinese have hidden compartments in their vehicles to smuggle goods over the border.”
2013 change in law	6	“The changing of the laws (in 2013) has affected buyers more, there are fewer now. Maybe about half as many.”

Rifle used to kill tiger	14	“No one uses snares. It is opportunistic killing from the road with a rifle.”
Necessity of hunting license to carry a rifle	8	“Poachers will get a license to hunt any type of legal game because you have to have a hunting license to legally carry a firearm.”
Importance of connections/trust within network	11	“People who know people kill tigers. Everything depends on a person’s connections.”
Transporting tiger products	19	“There was an instance where a tiger was killed and the carcass was found in a logging truck, buried under the logs.”
Reference to supply chain stages: Poacher to local buyer	24	“There are 3-4 Chinese buyers in Ussuriysk. They will hire smugglers to cross the border. Russians never cross the border, only Chinese do.”
Local buyer to regional buyer	19	
Ussuriysk	21	
Regional buyer to Chinese border	17	
Reference to tiger products: Skins (not in demand)	16	“Bones are in demand. Things like leg joints, knee caps, canines, tail joints, head parts, claws. No ribs. No skins either – those are burned in the forest. If they (poachers) had a way to sell it, they would. But there is no demand now.”
Bones	26	
Canines	17	
Claws	14	
Whiskers	3	
Entire carcass	14	
Musk deer poaching ¹¹	15	“Musk deer are absolutely poached, it’s a money game. One set of glands is worth 30,000 rubles (~\$400). Most regions you can’t even get a license for musk deer, so hunters just shoot whenever they see one.”

¹¹ I mention musk deer poaching for two reasons: it came up frequently in my interviews, as these deer are poached relentlessly for their tusks, and tiger products and musk deer products are often intermingled in the trafficking process. Linkages between the two trade warrants further investigation.

Chapter 3

Using crime script analysis to elucidate the details of Amur tiger poaching in the Russian Far East

Abstract

Poaching is the most direct threat to the persistence of Amur tigers. However, little empirical evidence exists about the modus operandi of the offenders associated with this wildlife crime. Crime science can aid conservation efforts by identifying the patterns and opportunity structures that facilitate poaching. By employing semi-structured interviews and participants observation with those directly involved in the poaching and trafficking of Amur tigers in the Russian Far East (RFE), this article utilizes crime script analysis to break down this criminal event into a process of sequential acts. By using this framework, it is possible account for the decisions made and actions taken by offenders before, during and after a tiger poaching event, with the goal of identifying weak points in the chain of actions to develop targeted intervention strategies. Findings indicate poaching is facilitated by the ability to acquire a firearm, presence of roads that enable access to remote forest regions, availability of specific types of tools/equipment, including heat vision goggles or a

spotlight and a 4x4 car, and a culture that fosters corruption. This crime script analysis elucidates possible intervention points, which are discussed alongside each step in the poaching process.

Introduction

Wildlife crime, including the poaching of and the illegal trade in wildlife, can manifest in many forms. Wild animals are poached and trafficked for a variety of reasons –food, clothing, cultural/traditional practices, medicinal uses, decorative items, and as live pets. Globally, the illegal wildlife trade is becoming ubiquitous, driven by the low risk, high reward nature of the activities (Viollaz et al. 2018; Warchol and Harrington 2016) coupled with globalization, which eases the challenge of international communications, coordination, and delivery (Van Uhm and Nijman 2020), and persistent demand, particularly from Asian countries (Wyatt et al. 2018).

Due to conservation biology’s emphasis on protecting biodiversity, much of the empirical research that addresses wildlife crime derives from this field (Kareiva and Marvier 2012; Kurland et al. 2017). Criminological theories and methods can aid conservation efforts to address wildlife crime by approaching and analyzing these crimes in a way analogous to traditional forms of crime – i.e. identifying the characteristics of where, when and why a specific target is selected and how the crime commission process unfolds (Kurland et al. 2017). Criminologists, engaged with identifying and assessing crime risk to detect patterns and the opportunity structures

involved in crime commission, can contribute to informing prevention measures to deter wildlife crime (Kurland and Pires 2017).

This article adopts a criminological framework that employs crime script analysis to further understand the dynamic crime-commission process of a specific form of wildlife crime – the poaching of Amur tigers in the Russian Far East (RFE). Crime scripts are guides that frame our understanding of a criminal’s behavior and actions. These scripts offer a framework to account for the decisions made and actions taken by offenders before, during and after committing a specific crime (Leclerc 2017). Crime scripts turn a crime from a static event into a process of sequential acts, with the goal of identifying pinch points or weak links in the chain of actions to implement targeted intervention strategies (Moreto and Clarke 2013; Lemieux 2020).

The illegal wildlife trade lacks generalizability: the species/products in demand and the crime commission process all have their own distinct markets, drivers, actors, supply chains and modus operandi (Pires et al. 2016; Van Uhm and Siegel 2016). Crime scripts are particularly well suited to dissect and interpret the variability and context specificity of wildlife crime. For example, Lemieux and Bruschi (2019) developed both an actor-based script to demonstrate the step-by-step process of how an individual offender hunts jaguars, as well as a product-based script to highlight the different actors and locations involved within the production process and subsequent smuggling to end market consumers of a specific product – jaguar paste. In a very different example, Viollaz et al. (2018) uses script analysis to

understand the financial crimes committed by wildlife traffickers throughout the trafficking process. Despite the variation in type of crime, actors involved, focus of script, etc., both these studies demonstrate how crime scripting can be used to elucidate pinch points in the crime commission sequence for a more nuanced understanding of criminal *modus operandi* in wildlife crime.

This paper builds further on the potential of crime scripting as a model to breakdown the crime commission process of wildlife crimes with the goal of developing context specific policy interventions. The crime script presented here is actor-based and focused on those involved in the poaching of Amur tigers in the Russian Far East (RFE). A sequential criminal event is complex; most criminal decisions or acts begin in noncriminal settings and understanding the variation in choice structuring properties of criminals requires detail-oriented observational and interview data (Brent and Kraska 2015). Therefore, for this study, an ethnographic case study approach was utilized. Data was collected from semi-structured interviews and participant observations with those directly involved – the poachers, buyers, middlemen and smugglers – in tiger poaching to understand the details of this criminal act from the viewpoint of the offenders themselves. By employing script analysis and thereby extending analysis to include all discrete acts of the crime commission sequence, I recognize that a crime-specific approach (Cornish 1994) is needed to understand the full range of intervention strategies to deter tiger poaching.

Although this type of fieldwork, involving continuous contact with persons involved in illegal activities, can be dangerous and difficult to conduct, the methods

were essential to the research goals. Such methods have been used successfully to interview those directly involved in the illegal markets of parrots in the neotropics (Pires et al., 2016), black caviar in Russia (Van Uhm and Siegel 2016), tigers in China (Moyle 2009; Wong 2016; Van Uhm and Wong 2019), and live wildlife trade in Peru (Leberatto 2016). Scholars have also employed other techniques to acquire related wildlife crime data, for example, interviewing NGO leaders, government officials, and scholars (e.g., Wyatt 2009, 2011; Arroyo-Quiroz and Wyatt 2019), law enforcement personnel (e.g., Runhovde, 2015, 2017, 2018; Warchol and Harrington 2016; Moreto and Lemieux 2015; Moreto 2016), a combination of environmental experts/authorities and law enforcement agents (e.g., Sollund and Runhovde 2020; Sollund 2017) and end market sellers (Moyle 2009). However, acquiring information from offenders themselves offers a firsthand account. This undiluted information is crucial and cannot be acquired with as much accuracy in any other way, thus I made the decision to interview offenders directly.

Criminological research has traditionally relied more on quantitative methods (Drury et al. 2011; Van Gelder and Van Daele 2014). Wildlife crime studies have also favored quantitative over qualitative methods (Lynch 2019; Moreto 2016). This article contributes to conservation and criminological literature by providing insight into how a novel approach, criminological ethnography, can be used to conduct qualitative conservation science research from a criminological perspective to understand the opportunity structures that facilitate Amur tiger poaching in the RFE. These results are part of a larger study focused on understanding the entire illegal

supply chain of Amur tigers from Russia into China. A related article (Skidmore 2021b) focuses on determining the specific drivers of poaching behavior; here the transition is made from criminal motivation to criminal intention and action. This paper begins with an examination into the theoretical framework and relevant literature for this study. Methodology is then described. Results in the form of a crime script are then presented followed by a discussion, policy interventions and a conclusion.

Theoretical Framework

Crimes should be viewed as a dynamic process rather than a discreet event. This process unfolds across several distinct acts or steps that cumulatively facilitate a criminal opportunity that offenders take advantage of (Sytsma et al. 2020). The identification of these distinct acts or steps that comprise an entire crime event was developed by Cornish (1994) and is known as crime script analysis. Cornish (1994) promoted crime scripting as a companion tool to inform situational crime prevention, a framework that details how an offender's choice to commit a particular crime can be influenced by changing the environment or situational context in which that decision takes place (Clarke 2008). This includes reducing the opportunities for offenders to commit a crime, decreasing the number of victims or the accessibility of the victim to the offender, and increasing the level of monitoring, making crime more difficult to commit (Viollaz et al. 2018).

Script analysis offers a tool to assist with understanding *criminal modus operandi* by highlighting how opportunity and the characteristics of the immediate environment facilitate a crime. Crime scripts are predicated on being crime-specific, and are produced by creating detailed, step-by-step accounts of crimes, in the specific contexts and environments where they occur (Lemiux 2020) and are particularly useful to understand complex crimes (Levi 2008). Creating a crime script often relies on gathering qualitative data (Borrion 2013) and using that data to follow a systematic methodology where the actions of the criminal event are broken down into stages. Cornish (1994) originally proposed ten stages, but more recently this has been modified into four main stages - *preparation, pre-activity, activity, and post activity* (Tompson and Chainey 2011). Each stage includes as much information as possible about resources, equipment/tools, actors, activities, and spatial/temporal details. By highlighting the procedural nature of crime, this type of analysis offers a framework to account for the choices and decisions made by the actors of each stage before, during, and after the commission of the crime they are associated with (Leclerc and Wortley 2013; Leclerc 2017).

The sequential acts of a crime have inherent causality (Tompson and Chainey 2011). Since actions along the chain of events are contingent on the ones before, intervention measures can be more acutely focused. Due to the focus on the situational context of criminal opportunities, analysis can support situational crime prevention by detecting unique intervention points that likely go undiscovered when crime is treated as a single event in time and space (Leclerc 2017). For example,

intervention measures are broadened to include not just the actors involved, but the physical environments that support crime, including spatial and temporal aspects (Clarke 1997). Overall, the context provided by script analysis supports understanding the immediate situational variables of criminal actions to manipulate the opportunity structures that facilitate crime. By using the 25 situational crime prevention techniques identified by Cornish and Clarke (2003) targeted intervention strategies can then be developed.

Case selection

Tigers are one of the most exploited wildlife species due predominantly to the enduring demand for traditional medicine in Asian countries, especially China (Moyle 2009; Wong 2016). The past 100 years has seen the global tiger population shrink from 100,000 to approximately 3,200 mature adults today, based on the last global assessment (Goodrich et al. 2015). Population declines are due to habitat loss and fragmentation, loss of prey base, and poaching for the international trade (Sharma et al. 2014; Miquelle et al. 2015; Robinson et al. 2015). Studies have examined the last link of the poaching supply chain: the domestic markets in China (Moyle 2009; Wong 2016; Van Uhm 2016; Van Uhm and Wong 2019) and Nepal (Karmacharya et al., 2018). The first link, including the range of people involved, their motives and methods, and associated links to the commercial trade, have been examined in Bangladesh (Inskip et al. 2014; Saif et al. 2016, 2018), India (Sharma et al. 2014) and

Sumatra (Shepherd and Magnus 2004; Risdianto et al., 2016). Similar data does not exist in Russia.

The RFE is the last stronghold of the Amur subspecies. Population estimates are difficult to obtain because only 3-4 % of Amur tiger range is inside of protected areas (PAs) (Carroll and Miquelle 2006; Matyukhina et al. 2014) and tiger status outside protected sites is generally poorly known (Goodrich et al. 2015). Based on a 2014-2015 survey, there is a population of approximately 350 adults (Amur Tiger Census 2015). Filling in the knowledge gaps about poaching is time sensitive, as poaching is the most common source of mortality for this subspecies (Robinson et al. 2015). The primary destination for tiger parts is across the border in China, however, only anecdotal information exists about the structure of the supply chain and the modus operandi of those involved.

Duffy and colleagues (2016: 346) state, "...we need to be cognizant of the fact that the illegal wildlife trade is not a singular phenomenon that requires a one-size-fits-all strategy to tackle it." Even within one species, tigers, the illegal trade is highly contextual. Product desirability varies, which will impact the steps taken to process a carcass directly after poaching. Tiger bones, whiskers, claws, canines, penises and pelts are all in demand, but in many cases for different uses in different markets with different consumers. For example, tiger bones are a consumptive good used in traditional Chinese medicine, whereas pelts are a luxury decorative item or used in ceremonial attire (Wong 2016). Products demand also fluctuates; prior to 2012 pelts were the primary demand for the illegal domestic trade, whereas bones are now the

most coveted item (Risdianto et al. 2016). Environmental factors (e.g., differences in terrain and accessibility), as well as variations in subspecies characteristics (e.g., behavior and population abundance) influences poaching pressure and the methods employed by poachers vary between subspecies and range countries. For example, in Sumatra, previous work has demonstrated that the most common poaching method is wire snares (Linkie et al. 2015; Risdianto et al. 2016); in Bangladesh there is a range of methods including poison, trapping, clubbing and sometimes shooting (Saif et al. 2018); in Thailand poachers have been known to poison carcasses of wild prey to lure and subsequently kill tigers (Duangchantrasiri et al. 2016.) These examples highlight the context-specificity of wildlife crime even within a single species. Considering the ability of crime scripts to capture the nuances and intricate details of the entire crime commission process, the method lends itself naturally to understanding possible intervention points in the poaching of Amur tigers in the RFE.

The conservation of tigers in the RFE is inextricably linked to the region's geo-political situation. The region, characterized by abundant, valuable natural resources, is also one of the most remote, impoverished, and corrupt regions in Russia (Wyatt 2014). The dissolution of the Soviet Union in the early 90s led to the collapse of the central government structure and existing regulatory systems, consequently, there was a weakening of law-enforcement systems and the emergence of criminal groups (Van Uhm and Moreto 2018). In their book on environmental crime in Russia, Stoecker and Shakirova (2014) discuss how corruption is so endemic in Russian society that an inherent system of commonplace norms and values allowing for the

inclusion of corrupt practices has permeated everyday life. These principles, legitimizing and fostering corruption, have become embedded so deeply that they are often inseparable from daily socio-economic relations and are accepted by the citizenry on the same level as formalized laws (Ledeneva 2013). Understanding the context of my study region prior to entry was crucial. Wildlife crime is facilitated by corruption, weak governance, and lack of enforcement (Wellsmith 2011; Wyatt 2013; Wyatt et al. 2018; Van Uhm 2016). In the RFE, the criminalization of many aspects of society in the post-Soviet era has engendered systemic corruption and organized crime, both of which have been shown to be associated with wildlife and environmental crimes in that region. Similar to the work of Wyatt (2009, 2011, 2014), Van Uhm and Siegel (2016) and Van Uhm and Moreto (2018) I found high levels of corruption among police and government officials within the wildlife trafficking networks in Russia.

Methodology

I collected primary data from the first-hand accounts of individuals who are directly involved in the illegal tiger trade (e.g. poachers, middlemen, buyers and smugglers). Empirical data was gathered during 5 months in the field spanning two separate trips to the Primorye region of the RFE: January-February 2019 and January-March 2020 (Figure 3.1).

Criminological ethnography

I drew closely from the work of Van Uhm (2016), Moreto (2016), and Moreto and Lemieux (2015) to develop my methodology, as these studies used ethnography to explore the nuances of wildlife crime issues. Within the field of criminology, ethnography has a long tradition dating back to Thrasher's *The Gang* (1927) and Polsky's *Hustlers, Beats, and Others* (1967), however only recently has it become a more established and accepted methodology in criminological inquiry (Treadwell 2019). Today, within the methodological literature, ethnography is defined using a variety of typologies. It is a flexible and adaptive research methodology that escapes categorization; identifying a canon can be an elusive and ambiguous task (Hammersley 2018). I situate my research methodology within the context of criminological ethnography. As a discipline, Treadwell (2019) emphasizes that criminological ethnography should be premised on its capacity to not just study people but to also study their social-cultural contexts and the associated meanings embedded within these systems; it is not possible to dislocate the cultural structures that the individual resides within. Adding to this, Miller and Miller (2015) suggest that criminological ethnography is rooted firmly in naturalistic inquiry and that ethnographic concepts like nonjudgement positionality, contextualization of study setting, and recognition of social network and structure help a researcher with this task.

My study was not classic ethnography in terms of its length of time or full immersion, as my total time in the field for this study was five months broken between two visits. However, I did not enter the region for data collection without

prior knowledge of the culture. Before the start of my research I had been to Primorye multiple times to participate in activities like The Amur Tiger Symposium in Khabarovsk in 2018 and in tiger monitoring research in Durmin in Khabarovsk Krai. Importantly, my study was centered around dedication to an ethnographic approach and methods. I believe that what is important about ethnography is dedication to capture a culture through the organic collection of data, to provide a deep analysis of a social world from the members' perspectives and to maintain the integrity of the phenomenon in question. The shorter time frame can be justified in part by the length of time poachers are accessible in the taiga during the Russian winter, as well as the nature of my research – I had prior knowledge that Russian authorities did not want this research project moving forward, which became a reality when I was pursued by the FSB (Russian Secret Service). Although I was deported from Russia before my planned study length was completed, after completing 116 interviews in addition to participant observation, I feel confident I reached data saturation for this topic and I had not planned to stay longer than one extra month.

Preparation and pilot project

Due to the nature of my research, interviewing human subjects who are in some cases active criminals, I undertook an extensive Institutional Review Board (IRB) application process (University of California Santa Cruz IRB # HS3434). Within this application, I had to explain how I would present myself to participants (overtly as a student researcher), obtain verbal informed consent, and the how I would guarantee the anonymity of willing participants (no identifying names/features would

be taken, and no recording devices would be used). Based on the complexity of my study, and logistically due to the remote area and the illegal and political nature of my topic, two separate research trips were planned. To the best of my knowledge, my study would be the first detailed examination of Amur tiger poaching, so my first priority was to establish that I could, in fact, locate and speak with those engaged in this activity. I therefore went to the RFE on a shorter (and successful) pilot project before I invested considerable time and resources into my full-length research project.

During my pilot project I needed to understand and mitigate risks as much as possible. I learned from my confidential gatekeeper in Russia that having my information confiscated and being deported would be my biggest risk, due to the political nature of my topic and the government's desire to keep tiger poaching information confidential. This source informed me that acquiring a scientific exchange visa, rather than a tourist visa, would be vital. Visitors claiming to be foreign scientists can be met with skepticism bordering on paranoia; therefore, such a visa would establish my legitimacy to conduct research in Russia. I would be uncovering information I suspected would implicate the government, so I needed every type of leverage available. As I was eventually deported from Russia, this visa became critical.

I needed to establish what characteristics (personality, age, sex) of interpreter would work best for my study. I worked with three interpreters during my pilot project and decided it would be best to work with a young woman, like myself. To generalize, women are considered non-threatening and submissive in Russia. As a

woman from the West, I would generally be offended by such positionality, however, in this setting, it was crucial. By appearing non-threatening to participants, my interpreter and I would have a greater chance of acquiring the information I needed. Finding the right interpreter was not an exercise I took lightly, and I spent months finding someone I knew would not only interpret but understand the importance of the work. For this type of subject, an interpreter and researcher must have a connection and comradery; my interpreter and I developed a strong bond – we had our own sense of rapport and trust – that was not only crucial for acquiring information, but also important for our safety.

Participant recruitment

Due to the covert and often unreported nature of criminal networks, finding those engaged in illegal activity can be a difficult task. The people involved are hidden populations outside the scope of conventional society, and they often purposely conceal their activities due to their illegality (Van Uhm 2016). The RFE is remote, has one of the lowest population densities in the world, there is generally no cell coverage, the climate is extreme (often -30 C in winter), and moving from village to village requires a 4x4 truck. Multiple trips to Russia before the start of my research and information acquired from my confidential gatekeeper helped me develop my strategy for recruiting participants.

While all hunters are not poachers, all poachers are hunters, therefore my initial task was to locate hunters. Legal hunting occurs during the winter months, a

time when hunters can be found concentrated on hunting leases, therefore the winter months were chosen as the timeframe for my research. The Primorye region is divided into about 100 large hunting leases (Figure 3.2).

Every hunter has a membership on one these large swaths of land, which are each autonomously run by a manager. These hunting lease managers were my main resource to initially secure introductions with hunters. Through my confidential gatekeeper, I was able to make initial contact with a few managers of hunting leases who subsequently asked hunters if they would be willing to speak to me. These initial introductions led to a snowball sampling method (Goodman 1961), where future participants were recruited among acquaintances of initial participants. By working through networks using the snowball sampling method, locating, and building trust and rapport with these hidden populations was possible (see Skidmore 2021a for additional description of methods). I followed this method for every new location I went, often getting references or introductions from participants to others in their network.

Interviewing and participant observation

I blended the methods of participant observations and semi-structured interviews, with a focus on the comfort and security of the participant, due to the sensitive and clandestine nature of the topic. Extensive effort and time went into building trust with participants, which included participating in sociocultural norms

and activities (e.g., meal sharing, going to the *banya*¹², going into the taiga¹³ on snowmobiles/skis and drinking vodka). Participation in such activities and forming social relationships with participants was essential to gain trust. In total, I spoke to 116 participants; these talks ranged from quick semi-structured interviews that lasted 30-45 minutes, to multiple day interactions that incorporated several informal interview sessions and hours of participant observations. Conversations varied from one-on-one talks to group-setting interviews, including conversations over a meal, excursions on snowmobiles into the taiga, and spending the night in a participant's residence. Interviews concentrated on flushing out the intricate details of poacher modus operandi, focusing on opportunity structures that facilitate this specific crime.

At the beginning of my field work I made every attempt to get one-on-one interviews with participants. However, I quickly learned that many participants felt more comfortable speaking in a group setting, typically with their hunting partners and usually felt more comfortable in their home. If I was introduced to a participant in a more formal setting, (i.e., an office), I actively sought invitation to a hunting base¹⁴ or to the home of the participant for a meal or *banya*. These are social activities, where people are drinking, become more relaxed and gossip is shared. These types of participant observations can often turn into informal, spontaneous chats and during these informal settings I could note important details that I would not necessarily

¹² In Russian culture, the *banya* or sauna, is a vital part of life.

¹³ The colloquial name for the boreal forest in the Russia Far East.

¹⁴ Hunting bases are usually located in remote areas, on hunting leases. They are permanent communal living cabins that groups of hunters will use as a base to hunt. They are used for a large portion of the winter months by the men who belong to a hunting lease.

have access to during a formal interview. The prosaic day to day activities of my participants often led to unexpected conversations. Capitalizing on these chance encounters, chance opportunities, became an unanticipated well of opportunity for knowledge.

There is ongoing debate as to what constitutes participant observation (Adler and Adler 1987); here, I define it similar to Van Uhm (2016), in that I participated in the everyday lives of poachers, seeking to disrupt their routines as little as possible, but did not actively participate in poaching¹⁵. I did, however, see the aftermath of poaching. For example, I was shown processed tiger products multiple times and taken into the forest to see a tiger carcass. DeWalt and DeWalt (2011) refer to this type of participant observation as direct, naturalistic observation and it facilitates a more in-depth understanding of the general context of the everyday lives of participants, as well as their *modus operandi*, that cannot be gleaned from interviews alone.

Hunting is an essential part of the culture – the lives of locals in the RFE are structured around it. During hunting season, friends come together, are gregarious and love to drink and gossip. I obtained much more information in informal group settings and adapted my approach to fit this reality. I would speak to 4 or 5 hunters at once, assess who knew what, develop camaraderie and then seek one-on-one conversations

¹⁵ Regardless of the ethical limits imposed by the IRB, the limits of ethnography can be morally subjective, and in this case, I would have never considered poaching a tiger. Protecting tigers was the fundamental impetus of my work.

with those I felt could especially aid my research. I knew my prior professional background as a ranger would be helpful, and the ease at which I adjusted to the life in the RFE made it possible for me to acquire sensitive information. Participant observation in organic settings engender trust and comfortability. Because of this I was able to establish insider status, gain better access to participants and their activities, and obtain a more nuanced understanding of the phenomena I was investigating. Gaining access, establishing trust and legitimacy was never a static development, but an ongoing and negotiated process within the study population (Berg 2004).

I learned that if I want to know about tiger poaching, I do not begin by asking about tiger poaching. I would prompt the participant and at times steer the conversation, but I learned the most from when I let the participant talk. I would begin questioning in a passive and indirect way by asking about how and when participants learned how to hunt, what they like about being in the taiga, and personal questions about friends and family. These types of questions are critical to building trust, understanding important contextual details, and letting themes emerge naturally. I would eventually begin questioning in a spectrum of increasing difficulty, beginning with questions about poaching legal game (i.e., many hunters kill game that is technically legal to hunt but they do not have a license for it), transitioning to questions about poaching wildlife that is frowned upon but not as politically sensitive as tigers (i.e., bear, musk deer), before finally (sometimes hour or even days later) asking about tiger poaching. Similar to Van Uhm's (2016) research, my participants

would often begin to tell me about a ‘friend’ who was involved in tiger poaching, later admitting that they themselves were also involved.

Analytic strategy

During the interviews I took extensive notes for each question, directing my interpreter to clarify specific details, expand a response, or pause for me to catch up with my notetaking when needed. Most of my notes included just the relevant details, however, verbatim quotes were also frequently recorded. During the interviews I also observed and recorded participants behavior and demeanor. These notes, both observational and interview, were reviewed, and discussions took place with my interpreter for clarity and accuracy as soon as possible following each interview. As a precaution, all data, including interviews, field notes and pictures, were transcribed, saved to the cloud and then deleted from the computer’s hard drive every night. Of the 116 participants interviewed, 43 (37%) admitted to being directly involved in the poaching and/or trafficking of tigers. This can be further broken down to local buyers (n=12) and poachers (n=31). Of the 73 participants who did not admit to involvement, many still provided useful information and, in many cases, personally knew individuals who were involved in poaching. The information from these individuals was used to triangulate data and build the script when relevant. Data were analyzed using Nvivo and interview transcripts were coded so that different themes and acts within the poaching stage were separated and analyzed individually to find commonalities across participants. Table 1.1 gives a breakdown of coding themes based on respondent interviews. This information is presented to see where the data to

build the script was derived from, as well as the frequency of specific codes. Coding was used to elucidate the four stages common in crime scripts: preparation, pre-activity, activity, and post activity (Tompson and Chainey 2011). Triangulation of field notes and participant observations also contributed to stage descriptions.

Results – Crime process and script

Opportunity plays the largest role in whether an individual actually *engages* in poaching. Amur tigers have a secretive, largely solitary lifestyle, occurring in low densities in regions of limited accessibility (Miquelle et al. 2007). Specific skills/knowledge or equipment, but above all, luck plays a deciding role in ability to poach. Tigers are shot opportunistically, either by those without initial intent, or by those that plan to poach. For those without initial intent, tigers are most often shot when they come into villages. In these cases, they are more frequently shot out of defense of human life, or livestock/domestic animal life. The value of tigers is common knowledge however, so even in ‘self-defense’ human/tiger conflict cases the tigers are almost always sold into the illegal trade after they are killed (Skidmore 2021b).

Traditional hunting of tigers rarely occurs – poachers seldom kill a tiger by finding tracks, following it, and shooting it. One poacher explained to me, “No one walks into the taiga anymore to hunt tigers.” Hunters will opportunistically shoot a tiger if they encounter one in the forest during the hunting season, but for the most part, poaching is intentional and premeditated. Tigers are almost always shot from

the road at night in the winter by hunters who are using heat vision goggles or a spotlight. In rare cases, hunters wait in a hidden location that has been pre-established based on camera trap photos or local knowledge of tiger movements (usually by a game trail or water source). Almost all hunters admitted that even if they had not poached a tiger, they would, if the opportunity presented itself. Simply put, as one buyer told me, “Whatever the amount of opportunities there was, that is the amount of tigers killed.”

This crime script that follows is for those hunters with *intent* to poach. Respondent quotes have been used to provide additional explanatory details per stage. Locations visited during the study can be seen in Figure 3.1. Table 3.1 summarizes the four stages of tiger poaching – preparation, pre-activity, activity, and post activity – and breaks each stage into steps. Each is described in additional detail below. Table 3.1 also summarizes information about who is involved in each step, as well as spatial and temporal details. In the far column possible interventions per stage are described, which are further unpacked in Table 3.2.

Preparation

There are a variety of resources, equipment, and tools needed in preparation to poach a tiger which are summarized in the first column of Table 3.1. Connections are an essential resource within the illegal tiger trade and the first consideration for those with intent to poach. The relationship between poachers and buyers has been influenced by the introduction of stricter regulations following the Russian

Government's adoption of the Strategy for Tiger Conservation in 2010, and their subsequent commitments to double the number of wild tigers by 2022 (Wikramanayake et al. 2011). Starting in 2013, new regulations on poaching, under article 258 of the criminal code, criminalized the possession of tiger parts, whereas before a suspect had to be caught in the act of poaching to be charged (State Duma 1996/2013). However, interviews from this research project suggest that rather than decreasing the number of poached tigers, the change in law has transitioned the trade's operation structure – moving it underground, tightening up connections between those involved, and become more streamlined and efficient. Consequently, stronger links between actors were formed and the trade has become a more organized network. The number of local buyers was reduced substantially, and the network of poachers and buyers became more reliant on familiarity and trust. Evidence suggests that the change in regulations did nothing to deter tiger poaching, but simply reduced the number of actors, with fewer actors accounting for more of the trade, and moved the practice further out of sight. My findings suggest that since 2013 the change in regulations have transformed the once rather open network into an oligopoly structure. Similar to van Uhm and Wong's (2019) study in China, trust and close-knit ties are important within the context of this illegal trade.

A potential poacher must first know how to offload the tiger as quickly as possible after it is shot. A local buyer who had been in the illegal wildlife business since the early 90s explained to me, "People who know people kill tigers. Everything depends on a person's connections." Having an 'in' (i.e., a trusted relationship that

will allow transactions of illegal wildlife) with a local buyer factors heavily into an individual hunter's ability to sell a tiger after it has been shot.

The buyers within a town are usually well known, and deal in both legal and illegal products, however as the tiger trade is so clandestine, not all buyers will accept tiger products and those that do generally only do so from hunters they know. Participants explained to me, "Everyone who hunts tigers sells their kill to the same man."; "The tiger poachers, it's the same ones who know each other. They have good relations with the buyer." Often tiger poachers are repeat offenders and have a firmly established relationship with a buyer. In most cases these offenders will take advantage of killing a tiger if the opportunity presents itself. However, local buyers will also get direct orders from regional buyers and in those cases, local buyers will put out requests to specific hunters for a tiger. New hunters will sometimes be allowed into this system, but it is only after a buyer has bought legal products from them, developed trust, and then will start accepting illegal goods.

Many of the steps leading up to a poaching incident are legal and can take place any time of year. This includes the acquisition of specific tools and equipment. With few to no exceptions, all poachers are already hunters and therefore have a firearm in possession. However, to legally carry a firearm on your person, a poacher needs a hunting license – this license can be purchased from a hunting lease for any type of legally hunted game. I was told by a hunting lease manager, "They need a hunting license to carry a gun, so poachers will buy any hunting license just to legally carry a firearm." Hunters usually have membership to one specific hunting lease;

therefore, they would purchase a hunting license directly from the manager of that lease.

Besides a firearm, other equipment must be acquired. Depending on the amount of money available to poachers, different equipment will be purchased. If a poacher has enough money, or can recruit co-offenders to share costs, heat vision goggles are the best choice. The goggles can be a prohibitive cost however, at about 300,000 rubles (~\$4000), which are imported from China. For those that cannot afford heat vision goggles, spotlights are purchased. Access to a 4x4 truck is a necessity due to the extreme winter driving conditions. Heat vision goggles were referenced 16 times during respondent interviews, followed closely by spotlights at 14, highlighting the importance of these specific types of equipment (Table 2.1). If possible, poachers form groups (recruit co-offenders) and go in two separate 4x4 vehicles. This is done to intimidate rangers, who usually work alone, if they are pulled over. Global Positioning System (GPS) units are also used frequently. For hunters who do not want to actively poach, a buyer will pay for the GPS coordinates of fresh tiger tracks. In rarer cases, camera traps are purchased to establish probable tiger locations.

Pre-activity

There is a very distinct temporal aspect in tiger poaching – nighttime in the winter is when most of the poaching incidents occur. Tigers are easier to spot and follow during the winter months, also hunters are staying in huts or base camps on

hunting leases during this time (as it is the season for legal game hunting), so opportunity to encounter a tiger is increased due to proximity to tiger habitat. These temporal findings concur with Miquelle et al. (2005) and Goodrich et al. (2011) about Amur tigers. My findings suggest this is also a risk mitigation strategy – if hunters are stopped in the taiga this time of year, they have a legitimate reason for being there (hunting legal game with their license and legal firearm). Also, due to the frigid temperatures that rarely get above zero for months, the carcass will keep for longer, if necessary. Due to the equipment used (heat vision goggles and spotlights) and need for secrecy, poaching is done almost exclusively at night. A park ranger told me, "All the hunters drive on the roads looking for tigers and every other hunter has heat vision goggles. Even if they wanted to, rangers can't do anything about the goggles because they are legal." If heat vision goggles are too expensive poachers will use large spotlights, but the method of driving around on roads at night is the same, regardless if goggles or a spotlight is used.

There is a clear spatial aspect as well – a constantly growing road network dramatically increases the opportunity and ease of poaching. One respondent told me, "Logging roads make the taiga more accessible, hunting is much easier." Another said, "Access to roads is how people kill tigers. They drive around at night until they see a tiger." There has been a substantial increase in road density in the region, usually cut for logging. 50-80% of the logging in this region is illegal (Environmental Investigation Agency 2013), and without a coherent natural resource agency, many of these roads are not permitted (Mol 2009). The largest increase in road density in the

RFE in the past 35 years has been within the secondary, remote forest road type (Bergen et al. 2020). Poachers use the road network, predominantly outside of PAs, to find tigers and shoot them from the car. The use of roads as a method of poaching was referenced 34 times during interviews, suggesting a vital role in the modus operandi of poachers (Table 2.1). I used OpenStreetMaps and GIS software to determine that 52% of the Primorye region is accessible to hunters/poachers from the road network (Figure 3).

The other method to poach tigers is using camera traps to establish sites that are well-traveled by tigers, including secondary roads, game trails and especially water sources (unfrozen water is difficult to find in the winter). After establishing a location that a tiger uses frequently, the poacher will hide and wait, sometimes for days, for the tiger to pass. Since tigers frequently do use the same trails, their movements can become predictable and local buyers will even pay hunters to give coordinates of these trails.

Activity

After finding a tiger while driving, the tiger is shot from the road. The first wound is usually not fatal, so the tiger will be tracked into taiga and shot again. Or the tiger is shot after the poacher has been lying in wait from a hidden location.

Post-activity

Figure 3.4 gives a graphic representation of the poaching and trafficking process. After a tiger is shot either from the road or from a location in the forest, what

happens next depends on the relationship a hunter has with a buyer and the buyer's preferences based on demand and the proximity of the carcass to the regional trading hub. The first scenario is a poacher will drive the carcass to the regional hub of Ussuriysk if they have a direct connection with a regional buyer, bypassing the local buyer and receiving up to three times the amount for the tiger. A buyer told me, "Choice is (for poachers) to offload poached tigers quickly in local village or drive to Ussuriysk for a higher price." However, this increases risk for poacher. This scenario is less common but does happen, especially if the kill location is close to Ussuriysk. It happens more frequently in the winter, as the carcass will not spoil. The second scenario is that if the carcass is far enough off the road a poacher can leave the scene and give the exact coordinates via GPS to a buyer for them to come process themselves. The third option is that a poacher will remove the entire carcass out of the forest and take it to the local buyer at a pre-established location. However, the most common scenario is a poacher will process the carcass in the forest and take specific parts that are valuable to the buyer. This processes almost always involves burning the skin, which is not in demand anymore and is too easily recognizable. I was told, "Pelts are not needed right now; hunters simply burn them. Pelts were popular before, now they are not. Now the joints are the most valuable" – this sentiment was universal. There is variation to what parts a buyer will take; canines and claws are always in demand, and some buyers only want these because they are small, worth the most money and easy to conceal. Many specific bones are wanted from the

carcass (kneecaps, leg joints, tail joints, neck joints and skull), as well as whiskers and the penis. Valuable parts are stripped from carcass and the rest is left or burned.

Almost all tigers, either in whole or already processed, go to Ussuriysk (Figure 3.1, Figure 3.4), where the regional buyers are located, before they are taken over the Chinese border (Figure 3.1, Figure 3.4). Ussuriysk was reference directly by 21 different participants (Table 2.1), indicating the importance of the city as a well know regional trading hub. Arsenyev and Blagoveshchensk are smaller hubs and are also used, but much less frequently. Local buyers will stockpile tiger products (as well as other illegal goods) and then drive the products themselves or recruit a smuggler to drive to a hub once or twice a year. A specific transfer date is established once they have a regional buyer lined up and, if necessary, a ‘paid corridor’ – where they have bribed the necessary people along their route in advance. One buyer described a scenario for getting tiger parts from a remote region to Ussuriysk. “Now the joints are the most valuable, and they can easily be grinded down into one bag full. You can fit it in a lady’s handbag. Sit on a bus with a lady’s handbag and you can smuggle 3-5 tigers.” Because the smuggling has inherent risk, local buyers will only transport products when they have enough inventory and a buyer lined up. The relationship between a local buyer and a regional buyer will influence if the products are processed or not. The role of trust within criminal networks has been demonstrated to play a large role. If there is trust, usually established over a long-term relationship, the local buyer can crush bones in advance of transport; if not, then the bones must remain whole, as proof of product authenticity.

Regional buyers are Russian and Chinese. If a local buyer sells to a Russian in Ussuriysk products are always then sold to a Chinese buyer before crossing the border. If a local buyer sells directly to the Chinese, then the subsequent step is not necessary. The exchange of products in Ussuriysk further highlights the fact that despite the different ethnicities between Russians and Chinese, strong mechanisms of trust must be in place to foster these exchanges. Interestingly, when interviewing one local buyer in the northern region of Primorye, he told me that when he was in Ussuriysk he has been ‘ratted out’ to the police by another Russian buyer, due to the competition between buyers. He was arrested, although no charges were brought against him. He said, “The Chinese are generally fair. The Russians can be untrustworthy, but yes, the Chinese are mainly trustworthy people. They are businessmen, their goal is to move products.” This sentiment, although just one example, is interesting and hints at the Russians trusting the Chinese more than they trust each other.

Russians do not smuggle goods across the Chinese border, this is done exclusively by the Chinese. Five border crossings are used: Blagoveshchensk/Heine, Kraskino, Poltavka, Pogranichny/Suifenne, Turiy Rog (Figure 3.1). Smuggling dates are pre-established and custom officers are bribed in advance for about \$50-\$60. Tiger parts and derivatives are transferred over the border either in hidden compartments within a truck or hidden within shipments of other goods. For example, I came across multiple instances when trucks transporting nuts or logs were used to

hide tigers. Below are some quotes from two different buyers to describe this border crossing:

“Everything crosses the border openly, because it’s their own people manning the post. Everything is paid for beforehand, so there’s no need for secrecy. The secrecy that does exist is just for show. Usually everyone works together - the Chinese and Russians.”

“Here everything is bought by us (Russians), but then it goes to China. Their mafia is very serious, their organization. Here in Russia, everybody works to sell, the police, the FSB (Russian secret service) – they all want to sell. Everything passes the border with ease. Whenever someone gets stopped, that’s just for show. Just to show that ‘yeah, the police are doing their job.’”

Discussion

Poaching tigers with traditional hunting skills is almost nonexistent. Poaching using poison, traps, and snares – used frequently in other tiger range states – is also very uncommon. Poaching is facilitated by the ability to acquire a firearm, presence of roads that enable access to remote forest regions (Figure 3.3), availability of specific types of tools/equipment, including heat vision goggles or a spotlight, a 4x4 car, and a culture that fosters corruption. The theme of corruption was overwhelming in interviews; it was mentioned in some capacity by 82 of the 116 participants or 70% (see Table 2.1 for a breakdown of corruption themes). Situational crime prevention can provide a framework to target intervention strategies. Select examples are discussed below. A full list of potential interventions based on the 25 techniques of situation crime prevention (Cornish and Clarke 2003) are listed in Table 3.2. These

interventions are based on opportunity reduction strategies as well as addressing offender motivation (described in Skidmore 2021b).

Increasing the effort

The road network, including presence and density, appears to be the largest variable influencing tiger mortality. Roads have a negative influence on carnivore survivorship is not novel – roads are a serious threat to many large carnivore populations because they facilitate human access. Road networks have been associated with increased access for hunters and have been linked to high mortality for jaguars in the Amazon (Espinosa et al. 2018), wolves in Finland (Suutarinen and Kojola 2017) and tigers in Malaysia (Mailley 2014), to list a few examples. In the RFE, previous work has demonstrated that roads increase tiger mortality due to poaching and vehicle collisions (Kerley et al. 2002). Findings from this study further support the link between roads and poaching. Intervention measures must focus on *controlling access to facilities*, by decreasing access to remote tiger habitat. This could include reforesting abandoned logging roads, preventing the construction of new roads, and restricting access to secondary roads *Screening exits* could be achieved by increasing roadblocks and vehicle checks at night along known access points to suspected poaching routes and forest area exit routes within the taiga.

The endemic corruption found in this region amongst government officials, rangers, custom officials, police and the FSB (Russian secret service) has been shown to be associated wildlife and environmental crimes (Usov 2012; Matejova et al 2018;

Wyatt, 2009, 2011, 2014; Skidmore 2021b). This research builds on these claims, finding these individuals to be frequently involved in tiger poaching and/or covering up these incidents. ‘Elite’ poaching of tigers (Skidmore 2021b), where poaching occurs because of the impunity/status of the perpetrator is one example of this. Corruption also occurs due to low salaries of those tasked with protection. One respondent emphasized, “The inspectors (rangers) get paid so poorly, so poorly. It is bad! I do not know one that is not corrupt in some way or another.” Based on interviews, rangers make between \$230-\$375 dollars a month – a very low salary, which increases the need/desire to accept bribes¹⁶. At the Russian/Chinese border custom officers take bribes of only about \$50-\$60 dollars. This small amount suggests they have low salaries as well, as they are willing to accept so little to turn a blind eye towards smuggling tiger parts across the border. By paying rangers and custom officials a higher salary, this could *deflect offenders* and disrupt poaching networks, as corrupt officials may be less willing to accept bribes. Also, by rotating these officials within posts/regions, offenders must increase their effort to constantly find another person willing accept a bribe.

Tighter *control on tools/weapons* needed to poach is one way to deter poaching well before the crime is committed. Increasing the effort required to acquire a hunting permit, as well as requiring subsequent documentation/accounting for game killed with hunting permit are options. Currently, a hunting permit can be purchased

¹⁶ For reference, in Russia GNI (Gross Domestic Income) is \$11,260/year or \$938/month making the average salary per ranger about 25-40% of the national average (World Bank 2019).

for any legal game, giving a hunter the legal right to carry a weapon, however there are no mechanisms in place to follow that permit to make sure the correct species was hunted. Tighter monitoring of firearms through a more accountable registration system and increased oversight of heat-vision goggles entering the country via China are also possible options.

Increasing the risks

Law enforcement monitoring (LEM), a tool of situation crime prevention, is being used increasingly to improve anti-poaching efforts worldwide. Hötte et al. (2016) implemented a framework for evaluating the success of law enforcement efforts to increase tiger numbers in four PAs in the RFE. This study demonstrated the value of having defined goals and specific indicators of success and noted clear increases in patrol effort and a partial reduction in threats to tigers at the select sites. Other studies have had success using similar LEM tools within PAs (e.g., Stokes 2010; Moreto et al. 2014; Johnson et al. 2016). However, so little of Amur tiger range lies within PAs (3-4%), consequently, intervention measures beyond the boundaries of PAs is necessary. This could include *extending guardianship* by installing cameras at the entrance of secondary roads, which are used to access the more remote parts of the taiga, or increasing patrol effort outside of PAs, possibly with the assistance of community groups. *Strengthening formal surveillance* could be achieved by increasing surveillance and roadblocks along known routes to hubs, as well as increasing patrol effort at night, or increasing ranger patrols to two officers to discourage intimidation.

However, due to the corruption in the region increasing resources for better law enforcement monitoring may not be the best option. Increasing pay may offset some corruption, but this is unlikely to happen given the region's lack of institutional support from regional or federal conservation agencies (Hötte et al. 2016). Funding could be acquired from international NGOs, but due to Russia's notoriety for barring and/or marginalizing NGOs within Russia, organizations they label and require to register as 'foreign agents', this may prove difficult (Amnesty International 2016; Matejova et al 2018). Increased law enforcement monitoring will most likely only work if the underlying problem of corruption is addressed.

Another option to *strengthen formal surveillance* could be to focus enforcement efforts in Ussuriysk. The regional hub is key in the illegal tiger trade: products exchange hands between local buyers and regional buyers (which is sometimes two steps if the local buyer sells to a Russian regional buyer who subsequently must sell to a Chinese regional buyer), then products exchange hands again to the smuggler. Van Uhm and Wong (2019) noted that within oligopoly network structures, as is the case in the RFE, enforcement efforts could be concentrated locally, rather than trying to combat the overarching structure. With the concentration of actors and products in Ussuriysk, this would be a natural location to concentrate efforts.

The presence of informal guardians, (i.e., ordinary citizens whose mere presence could deter poaching), appears to be absent in the region. Locals, out of fear of the police, retaliation, or due to community loyalty, almost never turn a known

poacher in. More research is needed to further investigate the motivations for this behavior. If there were a system of anonymous tipping, in which people could report poaching confidentially and without fear of discovery, this could *assist natural surveillance* and subsequently increase the risks associated with poaching. A reward for tips about poaching would most likely incentivize this behavior further. The effectiveness of this measure has been demonstrated in another range country, Sumatra, where anonymous informant tip-offs significantly increased patrol effectiveness between 40-50% (Linkie et al. 2015).

Reduce provocations

Motivation for poaching is also important when considering intervention techniques. Poaching for monetary gain and killing out of genuine self-defense of humans or livestock are very different problems requiring different solutions (Mailley 2014). Inskip and Zimmerman (2009) highlight how a lack of standardized reporting in human-felid conflicts have impacted the lack of cognition on successful prevention techniques. My research supports this trend in the RFE. A more consistent method for villagers to report livestock loss would help managers understand regional trends and ensure timely and ethical distribution of livestock reimbursement animals to *avoid disputes*. Such compensation-based programs have proven affective for other large felids including lions (Hazzah et al. 2014) and snow leopards (Mishra et al. 2003).

However, range-wide, there is ample evidence that villagers will use self-defense or defense of livestock as an argument to poach tigers to sell into the illegal

market (Karanth and Gopal 2005; Johnson et al. 2006; Goodrich et al. 2011; Saif 2018; Skidmore 2021b, among others). This behavior has been demonstrated in lion poaching as well (Everatt et al. 2019). In these instances, rooting out true motive could be difficult, therefore confounding intervention measures. 19 of 31 (61%) of admitted poachers cited economic poverty as their primary motivation (Table 2.1). The value of a tiger on the black market far outweighs the cost of livestock (Johnson et al. 2006); my research provides evidence that a hunter can expect to receive between \$3300-\$5000 for an entire tiger carcass, depending on the size and sex of the animal. In the RFE, Goodrich et al. (2011) demonstrated how poachers take advantage of human-tiger conflict situations and that almost 50% of human-tiger reported conflicts in the RFE were a direct result of human provocations, generally resultant from a poaching attempt. Strategies that aim to mitigate human-wildlife conflict will most likely have limited impact if poaching for monetary gain is the ultimate driving force of a motivated offender killing a tiger.

Human-tiger conflict is also driven by tiger depredation on dogs, a frequent occurrence due to the practice of keeping dogs staked outside overnight, usually in insecure locations. Goodrich et al. (2011) demonstrated that dogs in this region were killed much more commonly by tigers than other domestic animals (63% of 254 animals in the study) and that this behavior provokes a strong response and has been shown to be a primary reason for retaliation killing. To *reduce temptation/arousal*, community projects to build secure dog kennels could offer an inexpensive method to greatly reduce this conflict. Participants told me “Tigers have killed many of my dogs

– I have gone through so many dogs!”; “Villagers kill tigers for safety and because they kill our dogs.” My research concurs with Goodrich et al. (2011), in the recommendation that livestock is generally managed well in Russia, and the focus should be on securing dogs. By adequately securing dogs and subsequently reducing attacks, there would be less incentive to put villagers in the situation where there is the opportunity to kill a tiger.

Dramatic reductions in international demand for sable fur has caused prices in the RFE for these animals to fall rapidly – a wildlife market many hunters traditionally have relied on for income. There is evidence these hunters are transitioning to illegal hunting, including tiger poaching to offset lost income (Skidmore 2021b). Further research on how the crash in the sable market has affected tiger poaching, local attitudes towards tigers, and connections between poverty and tiger poaching could elucidate further how provocations could be reduced. *Reducing frustrations/stress* and could be achieved by providing alternative forms of income. For example, communities could be incentivized to protect tigers through payment for proof of tiger presence (camera traps with date stamp), or communities could be paid to help reforest old logging roads. These are examples of Payments for Ecosystem Services (PES) (Kurland et al. 2017), where locals get monetary incentives with the dual goal of providing income and reducing incentives to poach, therefore *extending guardianship*. Programs like these would also help *neutralize peer pressure* to poach.

Other countries have had success with the conservation of large felids by appealing to the pride and heritage of the locals, thus stigmatizing poaching (Nugraha and Sugardjito 2009) and *neutralizing peer pressure*. The people of the RFE define themselves based on being separate from the rest of Russia – they harbor strong beliefs about their adaptability, resilience, and ability to survive. By appealing to their innate pride, the tiger could be marketed as a powerful metaphor for their own character and fortitude, something that has been done successfully with jaguars in Argentina (Caruso and Pérez 2013).

Policy recommendations

Based on my research there are some SCP measures I do not think would be currently beneficial; looking at Table 3, many of the ‘remove excuses’ techniques are not applicable to the RFE’s current situation. I did not find a lack of awareness of regulations about tigers being illegal to kill, contrarily, everyone I interviewed was very aware that tigers were illegal to kill. They are equally aware that while there are large fines associated with poaching, the likelihood of being caught and charged is very low. Arrest and prosecution rates will need to increase before the laws create the desired deterrence effect.

The illegal tiger trade highlights the variability in wildlife crime. For example, in Bangladesh snares are the most common method of poaching, which means that foot patrols will be the best method to detect poaching effort (Linkie et al. 2015;

Risdianto et al. 2016). This is not the case in the RFE, where the tiger territories are much larger, and I did not find a single occurrence of snares being used to poach tigers. Linkie et al. (2015), found that frequency and duration of patrol effort was most effective in preventing tiger poaching rather than factors like distance patrolled. However, evidence in this study suggests that due to the large range of tiger territories, the methods employed by poachers in the RFE, and the distinct temporal aspect of poaching, patrol efforts that concentrate efforts on covering long distance, and focusing more effort at night and in the winter, would have a greater impact.

Kurland et al. (2017) urge the need to implement complementary techniques, and I believe there are numerous policy interventions that would prove effective. Below I have highlighted a few specific management options that are the most appropriate and should be implemented concurrently:

1. Address fragmentation by road network. Besides corruption, roads as a mechanism that aids poaching, were cited more frequently than any other theme (34/116 or 30% of participants, Table 2.1) during interviews. The road network has made 52% of the taiga accessible to poachers (Figure 3.3). Restricting access/reforesting old logging roads and preventing the creation of new roads is essential to reduce accessibility.
2. Poverty is the most frequently cited motivation for tiger poaching (Table 2.1); therefore, any management decisions must address this. In a Payments for Ecosystem Services (PES) model locals should be incentivized to protect

resident tigers by monetary schemes, i.e., camera trap proof of their occurrence. This would need to be monitored closely to make sure the money reaches all the appropriate people. Locals could also be paid to reforest old logging roads, which would improve tiger habitat, reduce access for poachers, and provide income.

3. Due to the inherently large territories of Amur tigers, relying solely on PAs or increasing PA size in the hope of retaining viable populations within these zones is not possible (Miquelle et al. 2010). As only 3-4% of Amur tiger range is within these areas, efforts to increase patrol effort outside of PAs is essential. For example, check points/roadblocks could be set up in pinch point locations or forest road exit points. Patrol effort should be increased at night and in the winter, due to the distinct temporal elements of poaching activity.
4. Corruption, either generally or within a specific agency, was referenced by a staggering 82/116 (71%) of the participants. It is an embedded issue that, along with poverty, fosters much of the poaching culture in the RFE. Corruption manifests in many forms: officials taking bribes by poachers at road checks or at the Chinese border crossing, 'elite' poaching or involvement in buying/smuggling of tigers by police/FSB/government members (Table 2.1) and covering up or lack of enforcement over poaching arrests. These examples of corruption are similar to other studies of corruption and wildlife trafficking (Wyatt, Van Uhm and Nurse 2020; Van Uhm and Moreto 2018; Wyatt and Cao 2015). Programs that seek to neutralize corruption, for

example anonymous tipping/whistleblowing, must be implemented. This could have many benefits including: providing monetary income to locals through incentivizing tiger protection, neutralize peer pressure anonymously in a very tight-knit community, and also help root out corruption.

Additionally, more research is needed to determine if increasing wages of officials would decrease susceptibility to accept bribes.

5. Target law enforcement efforts in Ussuriysk. Many of the supply chain steps and actors facilitating the steps converge here in a 'bottleneck'. Targeted intervention measures should be directed here.
6. Tigers killing dogs should be addressed urgently. Building dog kennels and shelters, coupled with informative discussions about the importance of securing dogs, should be implemented.

Conclusion

There are some limitations to this research. It is baseline data; as the first data collected on poaching within the Primorye region of Russia, there is nothing to compare it to. Information regarding trends is therefore impossible to make. Also, my research was focused on Russians, however, the involvement of the Chinese was referenced 33 times. There is no doubt Chinese nationals are a huge part of the trade as regional buyers in Ussuriysk, and then most likely the only ones involved in the transborder smuggling process. Interviewing Chinese involved in this trade would be beneficial for a more complete account of the illegal trade continuum. My research

focused specifically on the poaching and trafficking of Amur tigers in Russia. Other research has focused on the destination markets in China (Moyle, 2009; Wong, 2016; Van Uhm, 2018; Van Uhm and Wong, 2019). Besides data on the 5 most common smuggling routes between Russia and China (Figure 1.1), there is a lack of information on the transborder transference. Interviewing the Chinese involved in the trade would help elucidate these gaps. Additionally, studies have demonstrated that organized crime is involved in the timber trafficking in the RFE (EIA 2013; Wyatt 2014). Organized crime, tiger poaching and the trade of other illegal natural resources have been found in other locations (Risdiyanto et al. 2016). During interviews I came across multiple instances where logging trucks were being used to smuggle tiger products over the Chinese border. Future research should look more closely at examining the intersection between organized crime and the links between other environmental/wildlife products.

Amur tigers are under increasing pressure from poaching, which is a complex phenomenon involving poverty in the RFE, demand in China, endemic corruption, and fragmented habitat that poachers take advantage of. Many of these threats are intercorrelated and SCP, by way of crime scripting, has help elucidated how a combination of multiple management techniques can help reduce poaching pressure.

Table 3.1 Crime script for poaching and trafficking Amur tigers, with possible intervention techniques

Stage	Steps	Spatial	Temporal	People	Intervention
Preparation	<ul style="list-style-type: none"> • Hunter decides to poach a tiger and has connection with a local buyer in advance (usually poachers also sell legal game to their established buyer) • OR local buyer receives order from further down supply chain (Chinese buyer/regional buyer) and actively recruits a poacher • Obtain heat vision goggles or a spotlight if cannot afford goggles • Recruit co-offenders • Gain access to vehicle (4x4 and preferably 2 vehicles) • Buy license to hunt (for any legal species) so a firearm can be legally purchased and possessed • Buy camera traps (if not using a vehicle). Learn movements of tigers after compiling photos (Sometimes this information is sold directly to buyer who will pay for coordinates) 	<ul style="list-style-type: none"> • License purchased in hunting lease (poacher can be a 'member' of a specific hunting lease or can pay more to hunt as a non-member) • Rural villages • Goggles purchased from China • Camera traps purchased from China or the US 	<ul style="list-style-type: none"> • Anytime 	<ul style="list-style-type: none"> • Hunting lease manager • Poacher(s) • Local buyer 	<ul style="list-style-type: none"> • Better accounting for game licenses sold and what is subsequently killed • Stricter controls on firearms including more randomized weapon checks by ranger patrols • Stricter border control and monitoring on the importation of heat vision goggles from China • Mitigate human-wildlife conflict in rural villages • Link tigers to culture pride/heritage • Encourage anonymous reporting of poaching activities • Generate social pressure against poaching through outreach programs • Pay communities for camera trap evidence of tiger presence
Pre-activity	<ul style="list-style-type: none"> • Driving on roads, both main roads and secondary roads • Spotlighting or using heat vision goggles • Lie in wait in a hide up to a few days in a pre-established location 	<ul style="list-style-type: none"> • Outside of protected areas, usually hunting leases • PAs (more rare) • Roads, including primary roads and secondary roads, usually logging roads 	<ul style="list-style-type: none"> • Usually in winter • Night 	<ul style="list-style-type: none"> • Poacher(s) - usually groups of poachers in two separate cars 	<ul style="list-style-type: none"> • Encourage forest regeneration programs to reduce presence of logging roads • Prohibit construction of new roads as much as possible

					<ul style="list-style-type: none"> • Set up camera traps at entrance of secondary logging roads • Increase ranger patrols to two officers to discourage intimidation • Increase ranger patrols at night • Increase ranger patrols outside of protected areas
Activity	<ul style="list-style-type: none"> • Shoot tiger from car on road • If necessary, follow tiger into forest, shoot again • Or shoot tiger from hidden location 	<ul style="list-style-type: none"> • Outside of protected areas, usually hunting leases • PAs (more rare) • Roads, including primary roads and secondary roads, usually logging roads 	<ul style="list-style-type: none"> • As quick as possible • Night • Usually in the winter 	Poacher(s)	<ul style="list-style-type: none"> • Increase ranger patrols at night • Increase ranger patrols outside of protected areas • Incentivize citizens to report suspicious behavior or vehicles parked on the side of the road at night • Pay hunters a winter stipend to reduce need for poaching revenues.
Post-Activity	<ul style="list-style-type: none"> • Call local buyer to give GPS coordinates for buyer pick up in forest • OR transfer entire carcass to car • OR process carcass on site, take desired parts, burn skin • Leave scene • Deliver processed parts or entire carcass to local buyer if delivery has been pre-determined • OR drive carcass to Ussuriysk if poacher wants to take the risk for more money and has a connection with a regional buyer 	<ul style="list-style-type: none"> • Location of kill • Local village • Roads • Ussuriysk (or Arsenyev/Blagoveshchensk) • Blagoveshchensk/Heine, Kraskino, Poltavka, Pogranichnys/Suifenne, Turiy Rog 	<ul style="list-style-type: none"> • Products usually stockpiled by local buyer and a specific day of transport is arranged with regional buyer in Ussuriysk • Transfer can be any 	<ul style="list-style-type: none"> • Poacher • Local buyer • Regional buyer • Smuggler • Custom agents 	<ul style="list-style-type: none"> • Increase wages of wildlife rangers to deter bribery • Rotate personnel to limit impact of corruption • Increase effort to arrest and convict poachers • System of anonymous tipping to turn poachers in (possibly with reward incentive) • Increase patrol efforts and roadblocks on main roads to Ussuriysk

	<ul style="list-style-type: none"> • Local buyer drives products to regional hub and sells to regional buyer • Regional buyer organizes and bribes appropriate people to smuggle goods over Chinese border • Smuggler crosses border on a pre-determined date 		<p>time of year, but more frequently in the winter</p>		<ul style="list-style-type: none"> • Increase wages of custom officials at Chinese border as an incentive to not accept bribes • Increase roadblocks/ vehicle checks at night • Encourage detecting suspicious foot paths in remote forest areas
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Table 3.2 Examples of situational crime prevention intervention strategies to tiger poaching and trafficking

Increase effort	Increase risk	Reduce rewards	Reduce provocations	Remove excuses
<p>Target harden</p> <ul style="list-style-type: none"> • N/A 	<p>Extend guardianship</p> <ul style="list-style-type: none"> • Increase ranger patrols outside of protected areas (possibly using community groups) • Set up cameras at entrance of secondary logging roads 	<p>Conceal targets</p> <ul style="list-style-type: none"> • N/A 	<p>Reduce frustrations/stress</p> <ul style="list-style-type: none"> • Develop alternative legal and sustainable wildlife/natural resource economies • Pay hunters a winter stipend to reduce need for poaching revenues • Pay communities for proof of tiger presence (camera traps with date stamp). • Pay communities to assist with reforest old logging roads 	<p>Set rules</p> <ul style="list-style-type: none"> • N/A
<p>Control access to facilities</p> <ul style="list-style-type: none"> • Encourage forest regeneration programs to reduce presence of logging roads • Prohibit construction of new roads as much as possible • Restrict access to secondary/logging roads • Close forest roads at night • Increase PA coverage 	<p>Assist natural surveillance</p> <ul style="list-style-type: none"> • Incentivize citizens to report suspicious behavior or vehicles parked on the side of the road at night • System of anonymous tipping to turn poachers in (with reward incentive) 	<p>Remove targets</p> <ul style="list-style-type: none"> • N/A 	<p>Avoid disputes</p> <ul style="list-style-type: none"> • Mitigate human-wildlife conflict in rural villages, including compensation programs for tigers killing livestock/domestic animals • Standardize livestock reporting losses to ensure livestock reimbursement programs 	<p>Post instructions</p> <ul style="list-style-type: none"> • Signs in hunting leases saying it is against the law to hunt what you do not possess a permit for
<p>Screen exists</p> <ul style="list-style-type: none"> • Increase roadblocks and vehicle checks at night, 	<p>Reduce anonymity</p>	<p>Identify property</p> <ul style="list-style-type: none"> • Use camera trapping to keep records of 	<p>Reduce temptation/arousal</p> <ul style="list-style-type: none"> • Develop community programs to build dog 	<p>Alert conscience</p> <ul style="list-style-type: none"> • Signs in villages describing

<p>especially at the confluence of main roads and secondary/logging roads</p>	<ul style="list-style-type: none"> Publicize arrest and conviction of poachers Automated (or manual) number plate readers at key access points 	<p>individual tigers to compare against seizures (although they don't use the skins)</p> <ul style="list-style-type: none"> Better accounting of tiger carcasses that are killed in human/wildlife disputes 	<p>kennels to reduce dog mortality by tiger</p> <ul style="list-style-type: none"> Corrals/fences to prevent livestock depredation, especially in winter (reduce free ranging livestock) 	<p>fine/jail time associated with tiger poaching</p>
<p>Deflect offenders</p> <ul style="list-style-type: none"> Increase wages of wildlife rangers to deter bribery Increase wages of custom officials at Chinese border as to deter bribery Rotate personnel to limit impact of corruption 	<p>Use place managers</p> <ul style="list-style-type: none"> Pressure hunting lease managers to better monitor and track sell of hunting permits 	<p>Disrupt markets</p> <ul style="list-style-type: none"> Demand reduction campaign in China Increase enforcement efforts at Russian/Chinese border 	<p>Neutralize peer pressure</p> <ul style="list-style-type: none"> Generate social pressure against poaching through outreach programs Increase effort to stigmatize tiger poaching Link tigers to culture pride/heritage Anti-corruption units to minimize corruption in police culture 	<p>Assist compliance</p> <ul style="list-style-type: none"> N/A
<p>Control tools/weapons</p> <ul style="list-style-type: none"> Make hunting licenses more difficult to acquire Better accounting for hunting licenses sold and what is subsequently killed Stricter controls on firearms including more randomized weapon and license checks Stricter border control and monitoring on the importation of heat vision goggles from China 	<p>Strengthen formal surveillance</p> <ul style="list-style-type: none"> Increase ranger patrols to two officers to discourage intimidation Encourage detecting suspicious foot paths in remote forest areas Increase patrol efforts and roadblocks on 	<p>Deny benefits</p> <ul style="list-style-type: none"> Maximize efforts to enforce fines and prosecution of poachers 	<p>Discourage imitation</p> <ul style="list-style-type: none"> Increase conviction rate of arrested poachers Increase fines 	<p>Control drugs/alcohol</p> <ul style="list-style-type: none"> N/A

	<p>main roads to Ussuriysk</p> <ul style="list-style-type: none">• Increase ranger patrols at night and in winter• Increase police presence and raids in Ussuriysk			
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Figure 3.1 Study location in the Russian Far East displaying the main locations of recruiting participants (blue), regional hub Ussuriysk (green) and the five points of entry for smuggling over the Chinese border (red).



Figure 3.2 Primorye region broken into about 100 separate hunting leases.

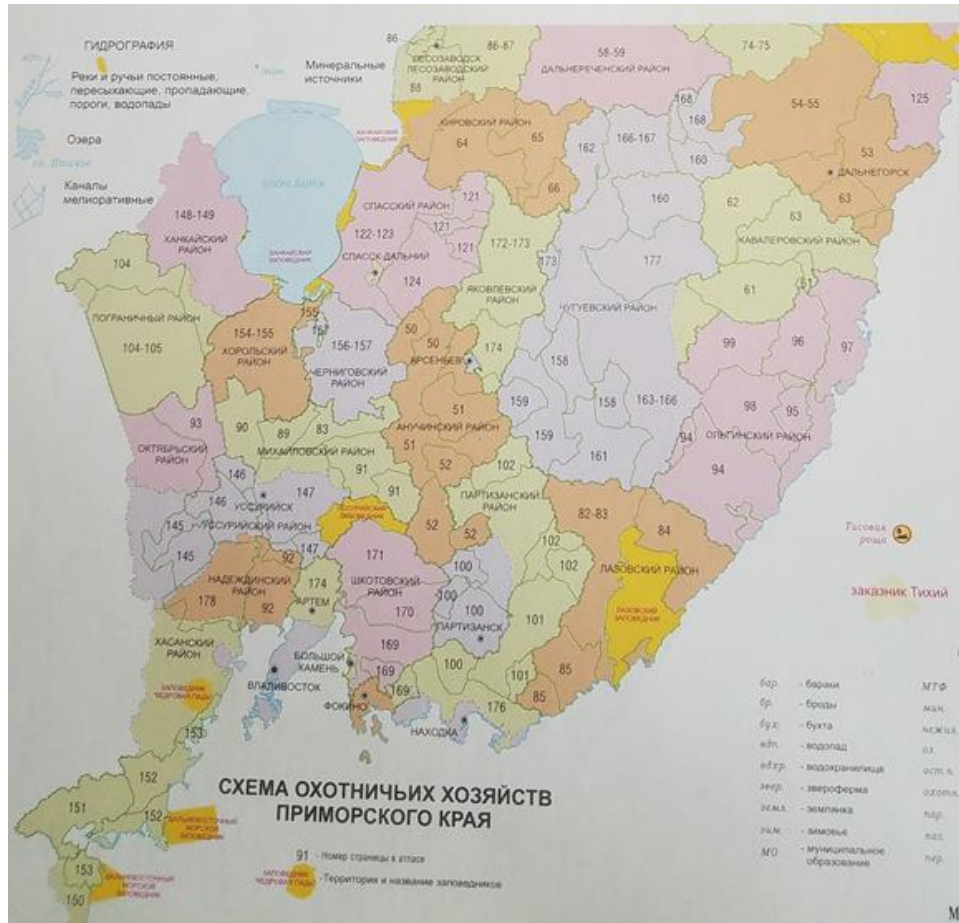


Figure 3.3 Accessibility to taiga from road network. To determine the level of accessibility created by roads OpenStreetMaps (OSM) was used to manually locate and digitize roads that are visible on satellite images. Changes were saved under the highway=track tag, which is defined by the OSM guide to be used for roads that are used for natural resource extraction. After the digitization of all the logging roads in Primorye, GIS software was used to calculate the total length of logging roads. From the data compiled from digitizing, logging roads span a little over 16,000 km² in Primorye. Using the method described in Slaughter et al. (2016), an addition of a 5km buffer zone was added to all of the logging roads, which provides an accessibility level that hunters may have into the taiga (assuming a hunter can walk 10 km in one day). Upon the addition of 5km buffers, the total accessible area increases to about 83,539 km². By dividing this value by the total area of Primorye, it can be deduced that roughly 52% of the taiga in Primorye is easily accessible to hunters/poachers.

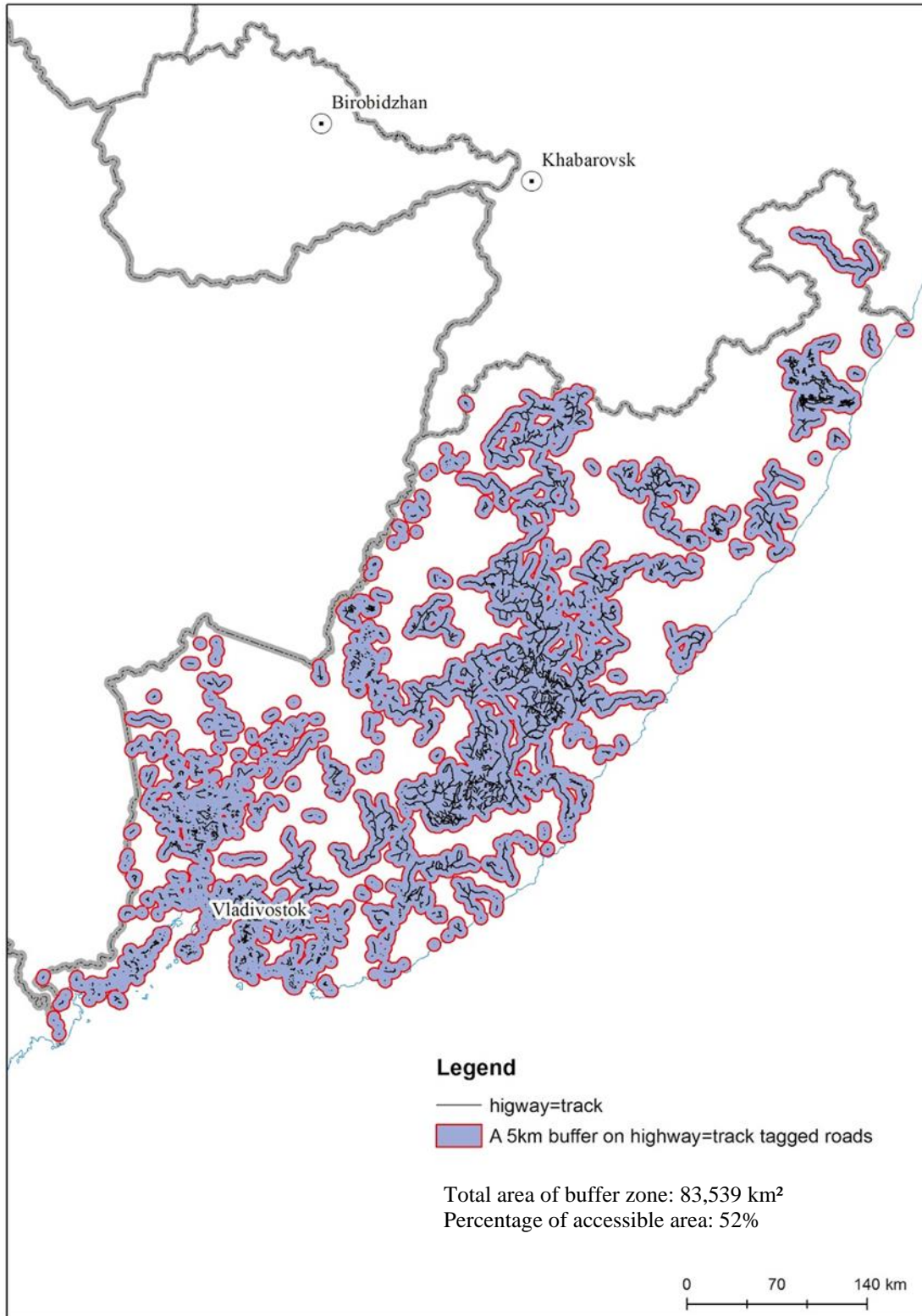
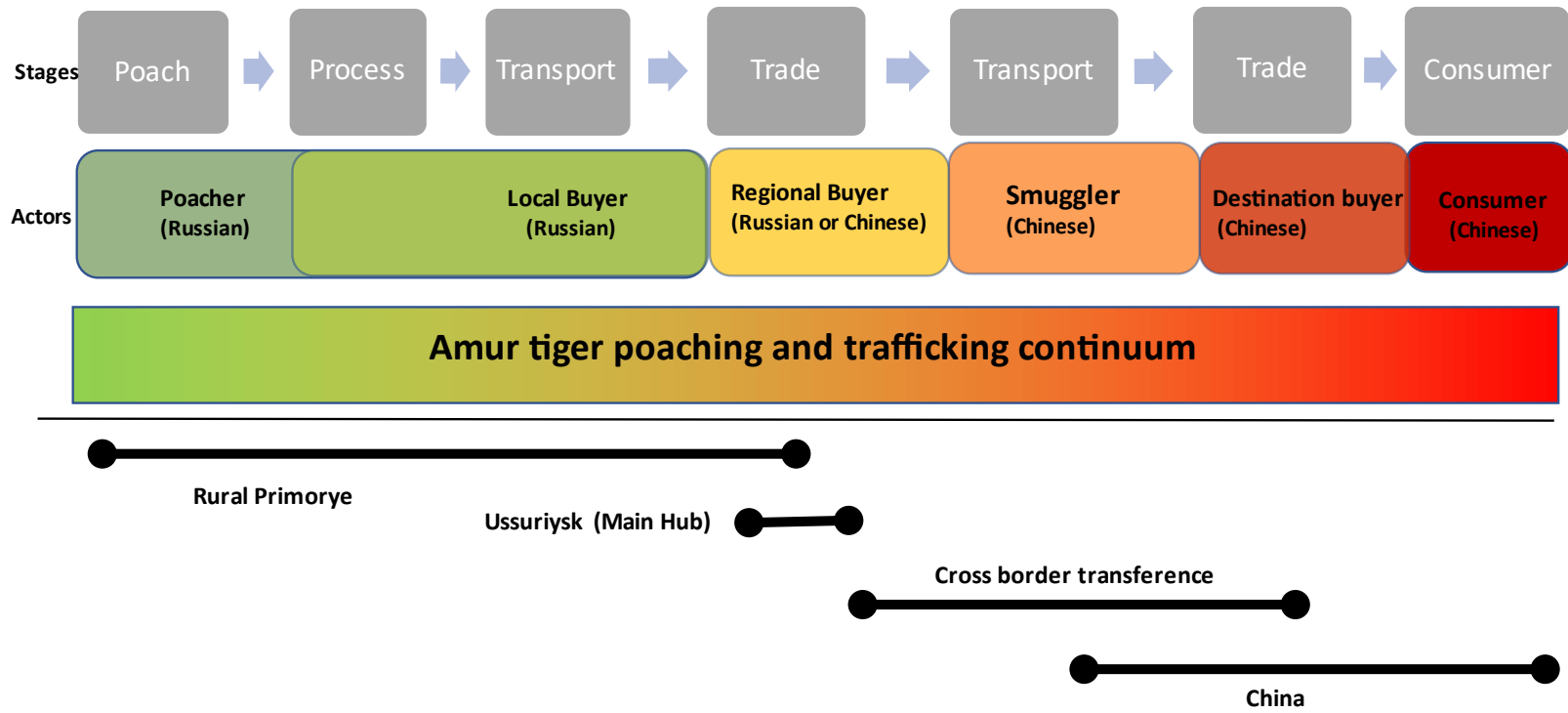


Figure 3.4 (Adapted from Lemieux and Pickels 2020). Amur tiger poaching and trafficking continuum. A visual display of the actors, stages, and locations of the illegal Amur tiger trade. The first row shows the various stages within the trade, from the poaching to the end consumption. The middle row shows the actors involved in each stage. The only overlap between actors occurs at the beginning where poachers have four options: poach tiger and leave in forest for buyer OR poach tiger and take the whole carcass directly to the local buyer OR poach tiger and process it in the forest before they sell to the local buyer OR if they have connection with a regional buyer, they will deliver the tiger or processed parts to Ussuriysk to bypass local buyer and receive a higher price directly from regional buyer. On the bottom of the graphic there is a temporal representation of where each stage is occurring.



Adapted from Lemieux & Pickles (2020)

Chapter 4

Demographic modeling to inform population stability: A case study to predict extinction risk of Amur tigers based on poaching offtake rate in the Russian Far East

Abstract

The first three chapters of this dissertation have outlined how criminological ethnography was used to explore the who, what, where, when, why and how of tiger poaching in the Russian Far East (RFE). Specific attention has been dedicated to highlighting the motivation and *modus operandi* of tiger poachers. In this final chapter the transition is made from criminal motivation, intention, and action to the *impact* of poaching on the Amur tiger population. To define conservation management priorities, it is essential to understand and quantify how poaching is impacting the overall persistence of the Amur population. This chapter focuses on how demographic modeling can be used as a tool to answer this question. It first describes how three different types of population viability analysis models could be used to determine extinction risk in large mammalian carnivores – species that are ‘evolutionary predisposed’ to extinction. Application to a real-world example, by

utilizing a case study based on my research in the RFE, is then presented. Given how poaching is a threat to tigers in the RFE and the goal is to model the rate of poaching to predict extinction risk, the type of data that would be needed and the best fit model based on that data is discussed – determining that an individually based stochastic spatial model would be the best choice. While my goal is to explain how the Amur tiger population’s extinction risk could be modeled and what data would be necessary, I also want to shed light on the importance of mixed methods in conservation research – how I employed a novel approach, qualitative interviews, to estimate poaching offtake in order to quantify extinction risk.

Introduction

Increasing anthropogenic pressure is causing a precipitous rise in species declines and extinctions across all taxonomic groups, however identifying the causes of decline are complex and laden with uncertainty (Sergio et al. 2021). Soulé (1985) aptly described the field of conservation biology as a ‘crisis discipline’, as biologists must act and inform management decisions often before having secured a comfortable theoretical or empirical knowledge base about the problem because many endangered species lack the time it would take to acquire complete knowledge. The conceptualization of extinction is simple – a species is extinct when its last member has died – however the mechanisms of extinction are much harder to understand and interpret (Purvis et al. 2000). The ability to understand threats to populations is well

documented, but the ability to predict extinction risk is limited (Brook et al. 2008). There is general consensus that many species extinctions are not due to chance, but rather the patterns and processes of extinction and risk are very non-random, with some taxa being more predisposed than others – a phenomenon known as selectivity (McKinney 1987; Purvis et al. 2000).

Evolved or intrinsic biological traits such as narrow geographic range, ‘slow’ vital rates (e.g., late sexual maturity, low fecundity), natural rarity, and specialization predispose species to extinction (Brooks et al. 2008). Extrinsic threats in the form of environmental factors, where the size and location of a species’ geographic range determines its exposure to environmental features and human impact, (e.g., habitat loss, over exploitation) compound this risk. Mammalian carnivores, many of which are facing population declines globally (Ripple et al. 2014), have been shown to demonstrate higher extinction risk due to a combination of both intrinsic biological traits and extrinsic environmental factors (Cardillo et al. 2005). These factors have a compound or synergistic influence on extinction risk: the processes are mutually and positively reinforcing to create a greater total effect than the sum of individual effects alone (Caughley 1994).

Demographic modeling, such as population viability analysis (PVA), can be used to synthesize factors that influence risk to a species and predict future extinction. A PVA can help reveal complex social systems and behavioral factors of a species that impact population demography (Caswell 2001; Horev et al. 2012). They can also uncover vulnerable life stages, particularly in mammalian carnivores with complex

life stages, as agents of decline can potentially act and accumulate impacts over several stages of life masking short term extinction risk and causing latent effects on population demography (Sergio et al., 2021). For many large carnivores, one of the primary agents of decline, poaching, presents the most significant threat to survival (Inskip et al. 2014). With limited time and resources, it is critical to understand how poaching can impact extinction risk and PVAs can be used as a tool to help elucidate this.

This chapter begins broadly by explaining extinction risk and examining the factors that make mammalian carnivores particularly vulnerable to extinction. It then outlines how demographic modeling, specifically PVAs, can be used to predict future extinction. Three approaches to modeling extinction risk, including the pros and cons of each, are discussed: two-sex matrix models, individually based models (IBMs), and multi-type branching process models. After assessing the demographic model options, the focus is narrowed, and a case study based off my research on Amur tiger poaching is presented. This case study is used to explain how poaching offtake can be estimated using qualitative interviews and how this can be incorporated into a PVA to predict extinction risk. I explain how, given the question (extinction risk) and specific life history traits of a tigers, why an individually based stochastic spatial model should be used.

I also discuss the benefits of incorporating GIS software to analyze the impact the road network in the RFE has on poaching. An increasing road network, as a function of logging in the region, fragments habitat and increases poaching risk, as

roads are used to access remote forest habitat. Road density negatively influencing carnivore survivorship is not novel – roads are a serious threat to many large carnivore populations because they facilitate human access. Road networks have been associated with increased access for hunters and have been linked to high mortality for jaguars in the Amazon (Espinosa et al. 2018), wolves in Finland (Suutarinen and Kojola 2017) and tigers in Malaysia (Mailley 2014), to list a few examples. In the RFE, studies have demonstrated that roads increase tiger mortality due to poaching and vehicle collisions (Kerley et al. 2002; Skidmore 2021c). Combining GIS analysis to determine the relationship between road density and poaching along with the PVA model can provide benefits beyond those of the individual modeling stages.

This case study is used to impart knowledge about the entire process of understanding extinction risk in tigers: how data can be gathered in the field centered on a specific question, analyzed based on best model fit for that question, and then used to inform management decisions. It also demonstrates how to collect data for a poaching offtake model using a novel qualitative approach that overcomes some of the bias in official statistics. While this case study is specific to Amur tiger poaching and extinction risk, the process is transferable and can be replicated for other species.

Extinction risk in mammalian carnivores

In conservation biology, the declining population paradigm is focused on the processes by which populations are driven to extinction in the form of external drivers (Caughley 1994). These extrinsic threats are deterministic, where direct

perturbation such as habitat fragmentation or poaching, cause species to be lost from a system. Once populations are small, they are vulnerable to extinction due to the population genetics and population dynamics that are characteristic of low numbers. These threats are stochastic in nature, emerging as chance events or random changes in environmental, demographic, and genetic processes (Caughley 1994). Besides the risk species face by declining populations and/or small populations, specific intrinsic biological traits have also been demonstrated to correlate to higher extinction probability. Empirically, the best-supported correlates of extinction include large body size, geographical range, dispersal ability, reproductive rate (i.e., late sexual maturity, low-fecundity, long interbirth intervals) and specialization (i.e., adapted to specific prey or habitat), high trophic niche, and naturally low population densities, (i.e., rarity) (Purvis et al. 2000; Brooks et al. 2008).

Mammalian carnivores exhibit varying combinations of most of these traits, many are intercorrelated. Large body size, a typical trait of mammalian carnivores, has been demonstrated to compound threats synergistically (Cardillo et al. 2005). For example, larger species tend to occur at lower population densities and have larger territories. Larger area requirements simultaneously increase the likelihood and frequency of contact with people and the probability of negative impact from disturbance (e.g., habitat fragmentation), which increases access for hunting/poaching pressure. As large-bodied animals are disproportionately exploited by humans (Jerozolinski 2003), increasing access further compounds risk. Large body size also correlates with low fecundity (Purvis et al. 2000), which decreases the ability of

species to respond to changing conditions, absorb external perturbations, and increases the difficulty of population recovery.

With all these factors to consider – deterministic threats, stochastic threats, and inherent traits – quantifying extinction can be a daunting task. PVAs are a tool to assist with this task. Conservation biologists can use PVAs to estimate the expected time to extinction of a population, expressed as a mean persistence time or as the probability of persistence for a given number of years (Caughley 1994). To parameterize a PVA effectively species-specific data, including age-specific rates of fecundity and mortality, must be included. The models cannot be used to identify the cause of decline in a species but can predict expected mean persistence time given input vital rates and fecundity rates remain constant. PVAs can effectively be manipulated in the parameters to ask “if...then” questions, which can help inform context specific management decisions. PVAs have shown to be particularly useful in identifying sensitive life stages, where targeted manipulation could make management most effective (Sergio et al., 2021; Morris and Doak 2002). Three approaches to modeling extinction risk include two-sex matrix models, individually based models (IBMs), and multi-type branching process models. Their characteristics are reviewed below.

PVA model options explained

Two-sex stage-structured matrix model

A matrix population model is a demographic technique for understanding phenomena at the population level based on information from the individual level (birth, death, and growth rates of individuals, i.e., vital rates). Conceptually, they are the simplest way to represent population structure, can be easily parameterized directly from observational data on the fate and reproductive output of individuals, and yield an incredible amount of useful information (Ellner and Rees 2006). While IBMs track individuals, matrix models break down the population into age-structured (Leslie matrix; Leslie 1945) or stage-structured classes (Lefkovitch matrix; Lefkovitch 1965).

Age-structured matrix models group individuals based on age whereas stage-structured matrix models group individuals based on other properties such as developmental stage and size. In this example, a stage-structured matrix model is ideal, when attributes of individuals besides age is a better indicator of survival and reproduction (Caswell 2001). Stage-specific vital rates, such as growth, survival, and fecundity, are used to determine the elements of a projection matrix; multiplication of the matrix by a vector of stage-specific abundances results in the stage abundances for the next time step (Caswell 2001). The matrix modeling approach, besides breaking down and consequent modeling of the population's internal structure, can be parameterized for the variation created by mating, and seasonality in breeding behavior. A sensitivity analyses can also be performed to understand how the outcome varies in response to changes in the parameters or vital rates (Caswell 2019).

Sex-specific vital rates are rarely incorporated into demographic population models, as most PVAs make the simplifying assumption that populations can be represented based on female vital rates and male dynamics are not necessary to incorporate (Caswell 2001; Jenouvrier et al. 2010). However, this simplification omits the inherent differences between sexes of species. For example, it assumes the neglected sex (usually males) have the same vital rates as females and that the absence of male parameterization does not affect fertility (Caswell 2001; Shyu and Caswell 2018). There are often important variations between the sexes, such as sex-specific demographic differences, complex mating systems, territoriality, and dispersal. Two-sex models are useful in conservation planning and to explore different management strategies, where there is either an unbalanced sex ratio or a unique social structure that must be accounted for (Jensen 2000; Morris and Doak 2002). A two-sex stage-structured matrix population model has the ability to incorporate the social structure of harems, while at the same time reproducing the same growth rate as the one-sex matrix population model (Tongen et al. 2016).

Matrix models are relatively easier to construct, program and parameterize, therefore simpler to compute, than IBMs (Erickson et al. 2015). However, matrix models require several simplifying assumptions that make their use in some situations subject to valid criticism. Matrix models are limited in the degree of density-dependence that can be incorporated and spatial heterogeneity that can be represented. They assume that all individuals in a life stage are identical, and have difficulty dealing with behavioral interactions within life stages (Caswell 2001).

Some level of spatial heterogeneity, species interactions, individual variation, and density-dependence can be incorporated into matrix models, but mathematical analysis becomes much more complex, and concise, analytic solutions, a strength of these models, can be lost. (Tuljapurkar et al. 2003; Doak et al. 2005; Ellner and Rees 2006).

Overall, two-sex models are useful in cases where vital rates for sexes differ and in polygamous species with complex social structures (e.g., when species form harem structures) (Gerber and White 2014). However, they require a lot of observational data and having the vital rate estimates necessary to parameterize two-sex models may be difficult to obtain in wild populations. Also, if density-dependence, spatial heterogeneity, and individual variation within life stages are important nuances for the species in question, incorporating these details can be difficult and may compromise the model's strength – its simplicity and succinctness.

Individually based model

This type of model is heavily reliant on simulation computations. It is a 'bottom-up approach' which begins with the separate 'parts' (individuals) of a system (a population) and then attempts to understand how the system's properties emerge from the interaction among these parts (Grimm 1999). In this way, IBMs are used to study how individuals influence population-level dynamics by tracking and specifying the actions and interactions of specific organisms through time (Grimm et al. 1999, Grimm and Railsback 2005). This type of approach is recommended if a

model is sought to illuminate information concerning biological details about organisms such as their specific behavior, activity, development, and interactions (Breckling 2002). This type of model is best suited for heterogenous systems where individual variability matters. Within small populations, in which chance events can lead to a high degree of variability in possible outcomes, it is necessary to incorporate stochasticity (Kenney et al. 1995). As such, this modeling approach is frequently used in PVAs for modeling small populations on the brink of extinction where chance events make a difference. IBMs break down the population further than a matrix projection approach by modeling its component individuals and simulating the fate of each individual in a population, rather than cohorts.

IBMs easily deal with complex spatial habitats, allow for variation and interactions among individuals, incorporate variables like demographic and environmental stochasticity, and allow for density dependence (DeAngelis and Mooij 2005). An advantage of IBMs is that they are general and can be parameterized for a specific species and unique attributes (e.g., sex, age and territory occupancy) representing more accurately the structure of a wild population (Kenney et al. 1995; Gilbert et al. 2014). Specification of movement, such as territoriality or dispersal, survival, and fecundity, can be analyzed for each individual animal and determined stochastically on an annual basis. Another strength of this modelling approach is that it can account for time lags and therefore emphasizes how the demographic consequences of a perturbation such as poaching might not be immediately obvious

because extinction may occur many years after the threat is reduced or eliminated (Kenney et al. 1995).

One of the downsides of this model is that it is complex to build and parameterize and requires a considerable amount of programming. Like two-sex matrix models, it also requires a well-studied population with a large dataset available, which is not always available for many species. IBMs are also designed to gain insight into particular questions rather than to attempt to mimic the real world, reducing their capacity as a broader communications tool (Starfield et al. 1995; Grimm 1999). Also, by focusing on using rules or parameters to describe individuals, IBMs are not suited to provide a complete view when answering questions at a population or system level (i.e., the sum is more than a total of the parts) (Grimm et al. 1999, Grimm and Railsback 2005).

Overall, when considering a small population prone to stochastic events, and the social or territorial behavior of the species in question may significantly affect its demography and population dynamics, an IBM is probably the best choice (Erickson et al. 2015). However, they are data hungry models and require extensive computer programming skills and sufficient information on life history traits – data that is not always available or obtainable for at-risk species.

Multi-type branching process model

This model, the simplest of the three described here, is a stochastic equivalent of a deterministic population model (Chapron et al. 2008). Branching process models

can be used to complement matrix population models by incorporating individual variability as a way to include demographic stochasticity (Caswell 2001; Erickson 2015). These models have not been widely used in conservation, but as they were developed to predict ultimate extinction – when there are no remaining individuals within a population – they can be useful to assess probability of population persistence (Kokko et al. 1998; Chapron et al. 2008). This type of model is deterministic with built-in stochasticity: individuals survive and reproduce independently (annual probabilities of survival, reproduction, age/class change, litter size), i.e., the mean behavior of the population predicted by deterministic model (Kokko et al. 1998). However, it incorporates probabilities of other outcomes, (e.g., poaching) to estimate eventual extinction probability. This model aligns well with conservation goals by assessing the impacts of specific stressors on wildlife at a local scale and can be parameterized to be context specific. One of the strengths of this type of model is its ability to mathematically quantify the impact of simultaneous parameter changes (e.g., litter size, female survival rate) on population growth and persistence.

Branching-process models have some inherent drawbacks. Although developed to predict extinction risk, they can only give a probability that extinction will occur and cannot account for when it will occur. For example, it is stage-structured (all individuals within an age class are grouped together) and not individually based, and therefore cannot account for all the potential impacts of threats such as poaching (Chapron et al. 2008). For mathematical robustness,

important nuances of species' ecology must be left out. This model is necessarily sex-specific, as including both sexes would require defining the mating system and thus introduce dependence between individuals and violate the model assumptions (Chapron et al. 2008). Consequently, males, and their impact on the social and reproductive structure of a population, are left out of the model parameterization. This type of model also does not include environmental stochasticity, which could underestimate the influence of external threats, especially for large-bodied mammals, which are known to be more sensitive to environmental variation (Sibly et al. 2007).

Amur tiger case study

Introduction

Tigers (*panthera tigris*) are threatened by the illegal wildlife trade predominantly due to the persistent demand for traditional medicine in Asian countries, especially from China (Moyle 2009; Wong 2016). Despite a domestic ban since 1993, there is an enduring market in China for tiger parts and derivatives including bones, claws, canines, pelts, meat, whiskers, and penises. One of the main source regions for tigers to sustain the Chinese market is the Russian Far East (RFE), which is located on the border of eastern China (Figure 1.1). After the fall of the Soviet Union in 1991, newly opened international borders heightened the demand for tiger products and eased their passage across the Russian/Chinese border. Demand, intensified by the buying power of the expanding middle class in China, was also influenced by the widespread poverty in the RFE, as state subsidies were withdrawn

and the region entered a protracted socio-economic crisis (Newell and Henry, 2017; Skidmore 2021a). Locals turned to any form of livelihood available, a situation facilitated by corruption due to the central state's collapse and has led to a precipitous flow of wildlife and other natural resources across the border to China (Braden, 2014; Skidmore 2021a).

Irrespective of the tiger's international charismatic appeal, CITES treaty protected status, and unprecedented international funding appropriated for their conservation (reported to be \$100 million annually, Moyle 2009) demand continues unabated and wild tiger numbers have declined dramatically. Between 2006 and 2014 there was a 42% decline in tiger range, a constriction that has left the species occupying only 6% of their historic range and a wild population of around 3,500 individuals (Goodrich et al. 2015).

The 13 recognized tiger range counties all are found in Asia, a densely populated and rapidly developing region where many factors have fundamentally affected the ability of tigers to persist (Goodrich et al. 2015). Tigers require large swaths of natural forested habitat and within most parts of Asia the conversion of suitable habitat to agriculture, logging, and human settlements has risen significantly. Although tigers face a multitude of extinction threats, including habitat loss and fragmentation, declines within their ungulate prey base, and an increase in human/tiger conflict, poaching is generally accepted to be the most immediate threat to the tiger's survival across its range (Kirkpatrick and Emerton 2010).

The RFE is the last stronghold of the Amur subspecies, with a population estimated to be about 300 adults (Wildlife Conservation Society). The Amur population is critically important for the species' overall survival. It is the only subspecies with a wilderness range that is generally ecologically intact and has one of the lowest human population densities in the world, therefore population expansion is possible (Kostyria et al. 2018). However, the population growth rate of Amur tigers remains depressed, and poaching is considered to be the most immediate threat to survival (Robinson et al. 2015).

A small body of literature has quantified the impact of poaching in the RFE on the sustainability of the Amur tiger population (e.g., Chapron et al. 2008; Goodrich et al. 2008; Robinson et al. 2015; Miquelle et al. 2015). For example, Goodrich et al. (2008) estimated survival rates using data from 42 radio-collared tigers and found that mortality was 83% human-induced, with most (75%) associated with poaching. Miquelle et al. (2015) combined two data sets spanning 1992-2012 to deduce causes of mortality in Amur tigers. Findings indicated that poaching was the highest contributing factor. The study asserts that poaching may account for a loss of 17–19% of the population each year. Both studies depict poaching levels to be of high concern, and even more troubling is the fact that they both took place within a PA in Primorye, called the Sikhote-Alin Biosphere Zapovednik. The level of poaching demonstrated is remarkable considering the population studied was within a PA. By being situated within just one PA, these studies lack the ability to explain trends or compare regions over the entirety of Primorye. Only about 3-4% of Amur tiger range

is within PAs (Matyukhina et al. 2015), as such one could expect even higher rates of poaching outside of PAs. With so much of the population occurring outside of PAs, this also increases the difficulty of traditional intervention methods (e.g., increase law enforcement monitoring, restricting access to protected areas). Previous work has demonstrated that poaching is a problem in the RFE, but how big of a problem is it? Literature searches and expert interviews have not identified attempts to gather empirical data or quantify the number of tigers poached in Primorye per year or per region nor how this could be affecting the viability of the population. Collecting data on the poaching pressure within the entire range of Amur tigers in Primorye is an essential first step to determine extinction risk to the population with the goal that the information can be used to inform conservation management decisions.

By recognizing the limitations of the above studies by focusing on one PA, but also valuing the results that demonstrate the stark reality of how high poaching pressure is within a PA, estimating a regional poaching estimate became one aspect of my fieldwork carried out in January-February 2019 and January-March 2020 in the RFE. This case study seeks to provide an overall picture of the status of Amur tigers in the RFE and to derive an approximation of number and location of tigers poached per year in Primorye based on interview data collected from those directly involved in the illegal tiger trade – the poachers, smugglers, and buyers.

Amur tigers in the context of the RFE – realities, difficulties, and uncertainties

80% of the Amur tiger range falls within the Primorye region of the RFE, which was the chosen location of this study. This region is dominated by the Sikhote-Alin mountain range with a boreal and temperate mixed forest, where Korean pine and oak forests are the two preferred habitat types for tigers and their prey (Miquelle et al. 2005). The Amur subspecies occurs in the northernmost habitat range of the species, where there are extreme winter temperatures down to -40 C. As a result of the climate, the tigers must survive in an ecosystem where productivity, and hence prey densities, are naturally low. Consequently, they have largest range requirements of any tiger subspecies (Miquelle et al. 2005); 200-450 km² area for females and up to 2000 km² area for males – an order of magnitude larger than Bengal tiger territories (Goodrich et al. 2010).

Amur tiger populations have been through several important transitions in history. Direct persecution of tigers in the Soviet Union took place until 1947, at which time there were approximately between 20-30 individuals remaining in the entire population (Matyuskin et al. 1996; Russello et. al 2004). After the prohibition of hunting in 1947 and the establishment of both anti-poaching controls and a network of PAs, there was a notable rise in the population to several hundred by the end of the 20th century. However, following the post-Soviet Union collapse in 1991, new open border policies with China led to new threats to tigers. Tigers were now both directly persecuted, as formerly sealed-off lucrative markets for tiger products in China were accessible, and indirectly threatened, as unprecedented access to the RFE exposed an untapped expanse of natural resources amplifying deforestation. The

opening of the Chinese/Russian border initiated specific conditions that led to a poaching explosion in the 1990s and approximately 60 tigers/year were poached during this time period (Miquelle et al. 2005). With the creation of Inspection Tiger and regional anti-poaching units, poaching levels are believed to have decreased again in the late 1990s. Current poaching rates are unknown; however, the majority of tiger fatalities continue to be linked to poachers (Goodrich et al. 2008; Robinson 2015), and anonymous scientists in the region are concerned the rate is increasing again.

Russia introduced new regulations in 2013, following a 2010 summit in Saint Petersburg (State Duma 2013). During this summit heads of governments of the 13 tiger range countries adopted an ambitious plan called the St. Petersburg Declaration to recover and double the range-wide wild tiger population by 2022 (Wikramanayake et al. 2011). These new regulations on poaching, under article 258 of the criminal code, criminalized the possession of tiger parts, whereas before a suspect had to be caught in the act of poaching to be charged. However, these new regulations have had an unexpected result. Rather than decreasing the number of poached tigers, the change in law forced the trade to move more underground, tighten up, and become more streamlined and efficient (Skidmore 2021c). Consequently, stronger links between actors were formed and the trade transitioned into more of what is considered an organized crime network. The number of local buyers was reduced substantially, and the network of poachers and buyers became more reliant on familiarity and trust. My research suggests that the change in regulations did nothing

to deter tiger poaching, but simply reduced the number of actors, with fewer actors accounting for more of the trade, and moved the practice further out of sight.

As tigers are a protected species, I refer to poaching as the illegal killing of tigers directly for the illegal wildlife trade as well as retaliatory killing as a consequence of human-tiger conflict. Motivations behind these two sources of poaching are difficult to untangle. Multiple studies have demonstrated how villagers will use self-defense or defense of livestock as an argument to kill a tiger and then subsequently sell into the illegal market (Johnson et al. 2006; Goodrich et al. 2010; Saif 2018). Within Primorye, there is evidence that motivated actors will use retaliatory killing as an excuse to legally kill a ‘problem’ tiger to sell, without any tangible human-tiger conflict (Skidmore 2021b, 2021c). This method of poaching tigers, by using human/tiger conflict as rationale, is growing in frequency (Skidmore 2021b, 2021c) and has also been demonstrated in lion poaching in Africa as well (Everatt et al. 2019).

Census data

Baseline census data for the Amur tiger population is lacking. Prevailing methods of counting tigers have difficulty accounting for three important ecological characteristics of the species: rarity, extensive range, and elusiveness (Karanth and Nichols 1998). Because of their secretive behavior, tigers cannot be visually counted in the field, consequently, most methods depend on counting tiger tracks. In Russia, the official ‘censuses’ of tiger populations are based on the assumptions that each

individual tiger can be identified by its unique track shape, and that track prints of every tiger can be simultaneously found and recorded (Miquelle et al. 2005). Some believe that both these fundamental assumptions are erroneous and therefore the results are neither total counts nor valid sample statistics (Karanth 1995). Camera trap methods have proved a much better method to estimate tiger densities (Matiukhina 2016), however in the RFE, due to lack of resources and the government's desire to insulate tiger science from non-Russian entities, very few surveys are done with camera traps. As only about 3-4% of Amur tiger range is within PAs (Matyukhina et al. 2015), counting tigers relies on the hunters of hunting leases, who are responsible for almost all wildlife census data in Russia (Miquelle et al. 2005). This system, while the best available due to lack of resources and the time hunters spend in the taiga, has inherent flaws. While there are methods to measure tracks (Miquelle et al. 2005), hunters receive no formal training to differentiate between tigers, and hunters are also the actors responsible for poaching. I am not suggesting all hunters are poachers, but all poachers are hunters (Skidmore 2021b). Based on correspondence with a tiger scientist familiar with the census process, hunters have strong incentives to report more tigers than they find, as it looks good for the hunting leases to which they belong.

An international NGO was responsible for the tiger census in 2005 (Table 4.1), but the NGO was not invited to participate in the 2015 tiger census, where the task was left to Russian scientists and organizations. Based on my communication with anonymous sources, this was due to the 2010 St. Petersburg Declaration on tiger

conservation. This Declaration put into the limelight Russia's desire to double its tiger numbers by 2022 (a feat that is biologically impossible; Robinson, 2015), when another summit is scheduled to be held in Vladivostok. Based on correspondence with scientists in Russia, numbers for the 2015 census have been artificially inflated to meet the goals of the St. Petersburg Declaration.

Poaching data

Similar to census data, current regional poaching data is unavailable and/or misleading. The Russian government does not release information about individual tiger poaching incidents or seizures, only total poaching events/confiscations per year. I was able to acquire the incident-specific data from an RFE-based NGO for the years 2006-2018. According to the official government numbers, the most tigers ever killed in a single year, including tigers that were either found in custom seizures, poached or killed in other human-related deaths, was 15 in 2012 (Phoenix Fund). However, according to anonymous sources in Russia, these numbers are highly unlikely, and there are concerns poaching numbers are at least 3 times as many as reported.

Logging

Amur tigers, and other species in the RFE, are under increasing threat from persistent deforestation due to the logging of high valued trees including Korean pine, Mongolian oak, and Manchurian ash. Logging is becoming ubiquitous in Primorye; estimates of upwards of 2.3 billion kilograms of hardwood each year are extracted from the RFE and more than half is harvested in violation of Russian law (EIA 2013).

As most logging in the region is selective for old growth hardwoods, it has a direct impact on the quality of habitat for a variety of species (Slaught et al. 2016). There is strong evidence that logging in the RFE is causing increased rates of poaching, as logging roads make the taiga more accessible (Skidmore 2021c).

Corruption proliferates within the logging industry. Due to its extensive natural resources and geographical position, Primorye has been the hotspot of illegal logging in Russia since the collapse of the Soviet Union (Wyatt 2014). Illegal timber from the RFE is cut and channeled through Primorye due to its proximity to the Chinese border, the primary market for the timber (Vandergert et al. 2003; Wyatt 2014). 50-80% of the logging in this region is considered illegal; various techniques including the forging of customs documents and the mislabeling of tree species occurs before timber ‘legally’ crosses into China (EIA 2013). Without a functioning natural resources agency many of the roads cut to log are not legal and there is little oversight over what species are felled and the volume of logging occurring (Mol 2009). Unrelenting demand for logging production has led to an expansion of road networks and the need for roads in increasingly remote areas. The largest increase in road density in the RFE in the past 35 years has been among the secondary, remote forest road type (Bergen et al. 2020). Incentives are high to log – a local Russian will receive \$800 per cubic meter of hardwood from one of these trees. This price inflates to \$3000 once in China (anonymous) – and therefore the practice is unlikely to slow.

Logging and logging roads threaten tiger populations in multiple ways. The tiger’s main prey, red deer and boar, rely on the nuts and acorns produced by the

hardwoods that are selectively targeted. Less food resources for the tiger's prey base reduces the carrying capacity of the ecosystem for these ungulates and creates an imbalance between populations of key prey species and the tiger itself. Lack of prey is driving tigers into human settlements with increasing frequency, where tigers kill livestock, domestic dogs, and sometimes people, incentivizing retaliatory killing (Skidmore 2021b). This rise in human/tiger conflict was a common theme during my interviews and is linked to poaching due to these types of confrontations (Skidmore 2021b).

Need to gather data

Uncertainty is the overarching theme for what is known about current trends and the fate of Amur tigers. Factors including incessant demand for their parts (Moyle 2009; Wong 2016), declines in suitable habitat (Dinerstein et al. 2007; Robinson et al. 2015), new regulations which have engendered organized criminal networks (Skidmore 2021c), endemic regional poverty and corruption (Mol 2009; Wyatt 2014; Skidmore 2021a), unknown and/or unreliable tiger census data (anonymous sources, communication), very little information on impact of poaching on tiger populations (Robinson et al. 2015), no baseline poaching data for the region, all contribute to this uncertainty and the need to acquire regional data on poaching rate.

Methods – poaching estimate

I collected data on incidence of tiger poaching during two separate trips to Primorye in January-February 2019 and January- March 2021 by interviewing

hunters/poachers and buyers (see Skidmore 2021a for a full account of methods). Unlike previous chapters where the focus was on poachers, to acquire a poaching estimate per region, my priority for this chapter transitioned to connecting to as many local wildlife buyers as possible.

I located buyers through the hunting network. Hunting is inextricably woven into the culture in the RFE, an activity that is as important a part of the social bonds within communities as it is for subsistence (Skidmore 2021 b). The Primorye region is divided into nearly 100 large hunting leases (Figure 3.2), and there are more than 60,000 registered hunters (Miller et al. 2013). Every hunter has a membership on one of these large swaths of land, which are each autonomously run by a manager. These hunting lease managers were my main resource to initially secure introductions with hunters. Poachers of illegal wildlife, including tigers, are also hunters of legal game. In order to find poachers to interview I had to first locate hunters, therefore, I needed to visit as many hunting leases as possible. Through my confidential gatekeeper, I was able to make initial contact with a few managers of hunting leases who subsequently asked hunters if they would be willing to speak to me. These initial introductions led to a snowball sampling method, where future participants were recruited among acquaintances of those I was initially introduced to (Goodman 1961). I followed this method for every new location I went, often getting references or introductions from participants to others in their network.

As described in Skidmore (2021a), local buyers were then recruited via snowball sample after building trust with hunters and/or poachers and securing an

introduction among acquaintances of those they knew (Goodman 1961). It was much easier to secure interviews with hunters/poachers than buyers and sometimes I would have to spend days building trust with a poacher in order to obtain an introduction to their buyer. There are many more poachers than buyers, especially after the change in law in 2013. This law change reduced the overall number of buyers and also resulted in them moving more ‘underground’ – conditions that contributed to them being less accessible and trusting. Snowball sampling is a technique common in criminological field research where there exists a need to identify a hidden population or specific individuals actively engaged in criminal activity. This method helped filter risk for me and vouch for my motives and trustworthiness.

Local buyers, usually in the course of also operating a legal business, keep meticulous account of the number of tigers they purchase, from where and from whom, making them by far the best resource as to how many tigers are poached per year and where in the region they come from. Buyers running their operations like a regular business reduces the likelihood that any tigers were double counted, as buyer numbers on tigers are mutually exclusive; they know from whom and from where tigers are purchased each year, information that poachers themselves do not know. This system avoids double counting, as I counted tigers in whole, not parts or derivatives, when the tigers are initially sold directly to a local buyer. These carcasses are sold again and pieced out further along in the supply chain (Skidmore 2021c), but by focusing on local buyers I could keep track of individual and separate tiger sales for an overall estimate in the region.

Buyers are well known regionally, and they buy a combination of legal and illegal goods, so hunters and/or poachers alike, know them. Buyers will purchase legal goods from any hunter, but illegal goods are almost always purchased from the same specific hunters within a tight network, as there is a level of trust involved, which made first securing trust with poachers essential (Skidmore 2021c). This also helped with data verification and triangulation, as the poaching/buying network is close-knit.

Primorye is divided into 22 counties, which are the units used to survey tiger populations (Miquelle et al. 2005). I decided to use the same demarcations for my study. Two regions were omitted, as they were urban centers, and no tigers were counted within those counties during the census. For the poaching estimate I needed to know where the tigers came from, not where they went along the smuggling route, which is also why I did not include the two regions where no tigers were surveyed. There are three main urban hubs which are used during the smuggling process from local buyer to regional buyer to smuggling over the Chinese border: Ussuriysk, Arsenyev and Blagoveshchensk. My estimations of tigers poached per year relied on acquiring data from the local buyer before transactions are made with the regional buyers in these three hubs, as carcasses are then mixed with other products (e.g., ginseng, bear paws) and in many cases processed before being smuggled over the border.

As mentioned, for my first three chapters, my research questions relied on information from poachers, however, for this final chapter, I needed to interview as

many buyers as possible. Before the change in regulations occurred in 2013, this would have been an arduous, if not impossible task. According to my interviews, after the new regulations took affect the number of local buyers was reduced by more than half, leaving no more than 20 in total in Primorye. While still difficult to locate, due to the illegality and secrecy of the illegal tiger trade, I was able to speak with 12 local buyers and obtain a poaching estimate for 11 of the 20 counties within Primorye. Although this is just over half of the regions, the area represents approximately 85% of the current range of tigers in Primorye (range based on Miquelle et al.'s 2005 survey). Therefore, I was confident that I was able to get data for most of the region.

Methods- Roads and logging

Besides poaching, logging is the main quantifiable threat to tigers that needs to be measured. To the best of my knowledge, the only study to directly quantify the risk of roads on Amur tiger survivorship is Kerley et al. (2002). This study demonstrated how the risk of adult female mortality increases and reproductive success decreases for tigers whose territories include primary roads. This is due to vehicle collisions, disturbance at kill sites, reduced habitat availability, and poaching. Although the sample size (15 tigers), was small and the study representative of only one PA within Amur tiger range, the data indicates that tigers living in the vicinity of roads incurred greater mortality and lower reproductive success than those with territories away from roads. My data support the finding in Kerley et al. (2002) and sought to build on those results by quantifying the influence of logging roads on tiger

poaching. The main threat posed by both legal and illegal logging is that the access roads have become a point of entry into the taiga and therefore the way the majority of poachers gain opportunities to poach. Poachers almost exclusively use the road network to find tigers with heat vision goggles or spotlights and shoot them from their vehicles (Skidmore 2021c).

To determine the level of accessibility created by logging roads OpenStreetMaps (OSM) was used to manually locate and digitize logging roads that are visible on satellite images. As I spent many months in this region, I had a strong foundation of knowledge about where logging roads may be located near the towns visited during the study. OSM was used to locate these towns and then identify and map logging roads that stemmed from them. Changes were saved under the highway=track tag, which is defined by the OSM guide to be used for roads that are used for natural resource extraction. After the digitization of all the logging roads in Primorye, GIS software was used to calculate the total length of logging roads.

Results

Poaching

Between 49-73 are tigers poached per year, a number that is 3-4 times higher than what is reported by individuals and organizations affiliated with the Russian government. A breakdown per county is provided along with the last reliable tiger population census in Table 4.1.

The last reliable tiger census was conducted in 2005, when there were 279-337 adults counted in Primorye (Miquelle et al. 2005). Poachers target adults, two years or older; males and females are targeted equally (Chapron et al 2008; Skidmore 2021c), which is why the focus of the estimate is on adults only. As the last reliable census was 15 years ago, I reached out to tiger scientists in the region who estimate the current adult population to be around 300 individuals. Based on a population of 300 adults and the most conservative poaching estimation of 49 killed, this equates to 16% of the regional population that is poached annually. A worst-case scenario of 73 tigers poached per year increases this value to 24%. The poaching rates vary by county considerably. If adult numbers from the 2005 census are similar to the current population, the highest percentages of poached adults occur in south central Lazo region and the northern region of Terney/Agzu, where as many as 45% and 30% respectively of the adult population is poached per year. Other regions in the central-coastal section of Primorye suffered only 2-4% of adult population loss. These numbers do not account for the regions I was not able to survey and, it can be assumed, I did not reach every buyer in the surveyed region.

Logging

From the data compiled from digitizing, logging roads span a little over 16,000 km in Primorye. These roads are shown, along with satellite examples of what road construction and logging practices look like in Figure 4.1. Using the method described in Slaughter et al. (2016), an addition of a 5km buffer zone was added to all logging roads, which provides an accessibility level that hunters may have into the

taiga (assuming a hunter can walk 10 km in one day). Upon the addition of 5km buffers, the total accessible area increases to about 83,539 km². By dividing this value by the total area of Primorye, it can be deduced that roughly 52% of the taiga in Primorye is easily accessible to hunters/poachers. To visually demonstrate fragmentation risk, considering a male Amur tiger can have a territory up to 2000 km², (Goodrich et al. 2010), this has been graphically represented in relation to road disturbance in Figure 4.2.

Model Selection – an individually based stochastic spatial model

The best-fit model to predict extinction risk is now selected based on the discussed models' strengths and weakness, the availability of data, as well as the characteristics of Amur tigers that are critical to include. While census data on Amur tigers is lacking, there is a solid amount of information on other characteristics of these tigers. What follows is what is known about tiger survival, fecundity, social structure, and behavior, details that will factor into model selection.

Amur tigers exhibit many of the large-bodied mammalian traits discussed earlier that make them predisposed to extinction risk. Karanth and Stith (1999) argued that, as with cougars, tigers are 'prolific breeders' and may overcome moderate levels of poaching. However, others (Robinson et al. 2015; Miquelle et al. 2015; Horev et al. 2012; Chapron et al. 2008), strongly disagree with this. For example, female cougars reach sexual maturity at 24 months and leopards at 36 months and exhibit inter-birth intervals of 18 and 20 months, respectively. In

comparison, female Amur tigers have a mean age of first reproduction at 48 months, with a mean inter-birth interval of 24 months (Chapron et al. 2008). Therefore, tigers have an overall lower fecundity than comparable large felids. Tigers also suffer from high infant mortality (Kerley et al. 2003), as such a female's realized lifetime productivity is much lower than predicted. Kerley et al. (2002) demonstrated how human-caused mortality, including poaching of mothers with cubs, accounted for 53% of all cub mortality and is a primary factor depressing lifetime productivity of individuals and recruitment rates for the population. When analyzing the population dynamics of tigers with these parameters, low population growth rates due to late age of first reproduction, longer inter-birth intervals and high cub mortality are the result, this species is shown to be especially vulnerable to poaching (Chapron et al. 2008).

Besides reproductive parameters, adult survival is critical to examine when trying to understand population stability. In long-lived carnivore species, analysis has shown that adult survival and, in polygynous species specifically, adult female survival is most important in determining population growth (Lambert et al. 2006; Chapron et al. 2008). Tiger population growth rate is highly sensitive to fluctuations in adult survival (Gilbert et al. 2014). Female survival appears to be particularly limiting to tiger population growth rates. Chapron et al. (2008) demonstrates that within the Amur tiger population, poaching of females is the most direct threat to the persistence of the population, where the population is not sustainable if offtake rate of females is above 15% (Chapron et al. 2008). Tiger poaching targets adults, and as most large carnivores evolved under conditions of high survival of breeding adults

(Goodrich et al. 2008) human-caused mortality often takes a heavy toll on this cohort. As a result, poaching affects both population size and growth as a result of the direct mortalities suffered, and can have profound consequences on population structure and trajectories over time due to selective targeting of a specific age class (le Roex and Ferreira 2020).

The impacts of poaching appear to extend well beyond the direct loss of individuals from the Amur tiger population. These tigers have nuances in their social and spatial structure that can influence demographic parameters and therefore must be accounted for in a model. For many variables, a single sex model based on female tigers is logical, as female mortality has been shown to be the most influential factor on population persistence, and there is no evidence that either sex is targeted more frequently (Chapron et al. 2008; Skidmore 2021b; Skidmore 2021c). However, tigers form a harem structure within their mating system and social instability created by the death of resident males can result in increased infanticide by immigrating males and a reduced reproductive rate (Smith and McDonald 1991; Goodrich et al. 2010). Without including males in the model parameters, infanticide rates by new males replacing poached residents, therefore lowering cub production and population growth rates, are important details that are left out.

Many aspects of the life histories of large carnivores make it challenging to predict how demographic changes will influence their associated population dynamics. Generally, large carnivores are long-lived in the absence of human persecution (Saether et al. 2010). However, in populations of long-lived species,

changes in age-structures as a result of off-take, can result in time lags in population dynamics, which can lead to misleading interpretations (Caswell 2001). Such factors are key to predicting extinction risk to Amur tigers. Demographic stochasticity is an important intrinsic factor that plays a large role in the population dynamics of large carnivores, especially in small population sizes (Soulé and Wilcox 1980; Lande 1993). In conservation biology, demographic stochasticity is known to have profound effects on small populations with complex structure, i.e., differences between age classes or spatial structure. Therefore, this parameter must be included in modeling Amur tigers.

Dispersal and territoriality are also social structure characteristics that are impacted in a way that can affect population viability in tigers (Horev et al. 2012). Amur male tigers have territories up to 2000 km², creating a considerable time lag between another male settling into the territory of a poached male. Females Amur tigers are known to have to ‘get to know’ a male before mating – they will not mate right away when a new male comes into her territory. This also creates long time lags between a male being poached and a female actually mating with a new male, a time period that can be over a year (anonymous). Cub survival is also lower due to cub mortality when their mothers are poached, which affects the structure of age classes and spatial structure of the tiger meta population (Kerley et al. 2003; Goodrich et al. 2010).

Because of the varying vital rates between males and females and the importance of the mating and social structure, males must be accounted for in this

model. A multi-type branching process model does not account for males and therefore is too simplistic and not an ideal choice. Branching process models also only predict *if* a population will eventually go extinct, and cannot estimate *when*, which is information that is particularly important for the endangered Amur tiger. Changes in age-structures as a result of poaching also have crucial implications for the demography of the population. Two-sex matrix models have difficulty incorporating this variation. Two-sex matrix models also have problems accounting for spatial heterogeneity, which is an important factor in the social structure of Amur tigers. In general, the most limiting factor of an IBM is lack of data to parameterize the model; however, detailed life history traits for Amur tigers are available. Therefore, an IBM, specifically *an individually based, stochastic spatial model*, while complicated to set up, is the best choice to determine the effect of poaching on Amur tiger population persistence based on the data available and the necessary species-specific considerations.

After selecting an individually based, stochastic spatial model, the next step will be to parameterize the model with data from two sources, Chapron et al. (2008) for survival parameters and Kerney et al. (2003) for fecundity parameters.

Fecundity: Age at first reproduction (α) is 48 months and inter-birth interval (*ib*) is 24 months. Females are reproductively active from 4–15 years of age, give birth approximately every 24 months and have on average 3 litters in their lifetime. Mean litter size is 2.4 ± 0.6 from 0-12 months and decreases to 1.3 ± 0.5 cubs by the time cubs are 12 months old due to high mortality (41-47%) in first year.

Total mean reproductive rate is 1.4 cubs/year, but only 0.7 cubs/year survive up to 12 months old. Total lifetime productivity for a female is 6.49-7.7 cubs/breeding female (cubs surviving to 12 months). Litters range from 1-4 cubs, where the probabilities of litter size are: 1 cub (0.31), 2 cubs (0.19), 3 cubs (0.31), 4 cubs (0.19).

Survival rates: The tiger population will be divided into four classes based on age and reproductive status. Cub survivorship (0-12 months) – 0.6; Juvenile survivorship (12-24 months) – 0.9; Transient survivorship(> 24 months but non-breeding) – 0.7; Breeding adult survivorship – 0.9

Census data: Based on expert sources in the RFE, the population census data for Amur tigers is unreliable and possibly inflated by the Russian government. Therefore, one should use different population sizes of adult tigers, such as starting population sizes of 200, 300 and 400. Modeling the effects of these starting population sizes on different poaching scenarios based on both my conservative and worst-case estimates (49-73 tigers poached per year) allows one to evaluate uncertainty in starting population numbers and poaching rates to measure effect of different scenarios on population persistence. Following Horev et al. (2012)'s study, this model will assume a fixed number of individuals that are being poached annually, regardless of the changes in population counts. This will more realistically represent the study region to demonstrate an increasing influence of poaching (the ratio of poached individuals in the overall population) in a decreasing tiger population.

Discussion and future research

Poaching in Primorye appears a much larger problem than publicly-released statistics suggest – these results suggest poaching rates could be between 3-4 times higher than those published. What is unclear is the actual risk poaching poses and the threshold for population collapse. Will this rate of poaching cause the population to go extinct? How long would it take? Miquelle et al.'s (2015) research within one PA in Primorye suggests that poaching accounts for a loss of 17–19% of the population each year. This research on most of the Amur range within Primorye region (85%) indicates that poaching, when based off the best estimate of 300 adults, is removing between 16%-24% of the population per year depending on conservative vs. worst case scenarios. However, some areas (if populations are similar to the 2005 estimates) see rates of poaching as high as 45%.

Kenny et al. (1995), Chapron et al. (2008) and Horev et al. (2012) all found that a rapid increase in the probability of extinction occurs when poaching from the same population is sustained over time. Kenney et al. (1995)'s research suggests that in a population of 120 individual tigers with a sustained poaching rate of approximately 10 tigers per year (8.3%), there would be a probability of extinction over 95%. The numbers from Miquelle et al.'s (2015) research on a local population and this research, including both regional and local estimate, suggest poaching rates to be higher than the Kenney et al. (1995) study, which supposed less than 10% of the population poached per year. Chapron et al. (2008) suggested that Amur tiger population cannot be sustained if offtake numbers of females is over 15%. Considering both males and females are targeted equally, (Chapron et al. 2008;

Skidmore 2021b; Skidmore 2021c), based on this study, with a regional offtake rate between 16%-24%, this would be above the 15% threshold. Tiger populations do not appear to be targeted equally, so local population collapse may be more likely than regional. Within Primorye, the majority of poaching is concentrated in the north and southeast. The factors influencing this would be important to tease out. Are more tigers being poached due to tiger population density? Human population density? Road network density? Or a combination of all three? Models per county as well as for the entire region would be useful to compare overall trends and make predictions.

The two most direct external threats to tigers are the road network, which fragments habitat and increases the risk of the second threat – poaching (Kerley et al. 2002; Robinson et al. 2015; Skidmore 2021c). Primorye, although the best remaining intact suitable habitat for tigers globally (Kostyria et al. 2018), is at risk of severe fragmentation. Roughly 52% of the taiga is easily accessible to hunters via a road network that continues to expand, for the most part due to logging. Road construction and logging show no signs of ceasing. Roads impact tiger populations in multiple ways, directly via providing access to poachers and due to vehicle collisions, and indirectly via disturbance and loss of habitat for both prey species and tigers. Kerley et al. (2002) demonstrated that tigers living in the vicinity of roads incurred greater mortality and lower reproductive success than those with territories away from roads, and my research supports this (Skidmore 2021b, 2021c). It is safe to assume that successful conservation of tigers in this region must approach these two problems,

poaching and the road network, as interrelated, and develop strategies under this assumption (See chapter 3 for a full account of policy strategies).

Future research should focus on combining models to demonstrate a synthesis of these two risks. The road data that I have presented in this chapter tells a very compelling story – that over half of the taiga is accessible to poachers. However, this data is not currently in a useable form to input into a model. Within a model, logging roads can be parameterized as a function of habitat fragmentation, therefore a reduction in suitable tiger habitat, or as a function of access to poach tigers. With a focus on roads as a function of accessibility GIS tools can be used to demonstrate the relationship between road density and poaching occurrence. Future research would need to break down the road data by the regions used for the poaching rate data, to see if it can be demonstrated quantitatively that an increase in road density increases the number of tigers poached per region. An IBM and GIS spatial model combined within a single analysis could give a better overall picture of extinction risk as a function of poaching and how the road network contributes to this risk.

Finally, survival and fecundity rates are well understood for the Amur population, however the dearth of reliable census data, both due to survey method and the Russian government's secrecy and manipulation, is a problem. Future research should focus on obtaining reliable census data, admittedly, a complicated task. In order to get the most predictive power out of the IBM model, reliable census data should be a priority. Most tiger experts agree that the adult population of Amur tigers is around 300, a number that should concern the conservation community. This research

was the first attempt to estimate the number of tigers being poached per year in Primorye and future research should focus on using this data, in conjunction with reliable census data, to determine the impact of poaching on extinction risk.

For threatened species, estimates of extinction risk provide important information for devising strategies for conservation and management. This chapter has demonstrated a novel approach to collecting poaching estimate data, via the use of qualitative interviews. It has also shown how an individually based stochastic spatial model would be the best way to interpret that data to predict if rates of poaching are sustainable or would lead to Amur tiger population collapse. These methods can and should be used to gather poaching data on other at-risk species.

Table 4.1. Survey data from Miquelle et al. 2005 along with poaching estimate data collected in 2019-2020.

Area	Total # tigers in 2005	Adult Males	Adult Females	Sub Adults	cubs	Unknown	Poaching estimate
Anuchino	8-10	2-3	4-5	1	1	0	1-2
Chernigovka	1-3	1	0-1	0-1	0	0	unknown
Chuguyevka	30-32	11-12	11-12	4	4	0	2-3
Dalnegorsk	9-12	1-2	6	0	1-2	1-2	1-2
Dalnerchensk	24-26	4-5	11-12	3	5	1	1-2
Kirovsky	7-8	2	2-3	0	3	0	unknown
Krasnorechenskiy	53-59	8-10	20-22	4-7	15	5-6	1-2
Lazo	22-27	3-4	10-13	0	8	1-2	10
Lesozavodsk	6	1	3	0	2	0	unknown
Mikhaylovka	6	1	3	0	1	1	unknown
Olga/ Kavalerovo	27-44	6-10	10-15	0	4-12	7	10-15
Partizanski	10-12	1-2	5-6	0	4	0	2-4
Pogranichny/ Khankayskiy	2	1	1	0	0	0	unknown
Pojarski	37-42	9-10	18-21	0	9	1-2	7-8
Shkotovo	9-11	3-4	4-5	1	1	0	unknown
Spassk	8-10	1	2-3	3-4	2	0	1-2
SW Primorye	10-13	3	4-5	0	2-4	1	unknown
Terney/Agzu	76-89	25-30	26-31	0	13	12-15	13-23
Ussuriysk	6	2	2	0	2	0	unknown
Yakovlevka	6-7	2	2-3	1	1	0	unknown

Figure 4.1 Map of Primorye with all the highway=track tagged logging roads. 16,540 km sum of all length of roads. A. depicts 366 km² clear cutting in northern Primorye; B and C are examples of roads cut for selective logging in central Primorye

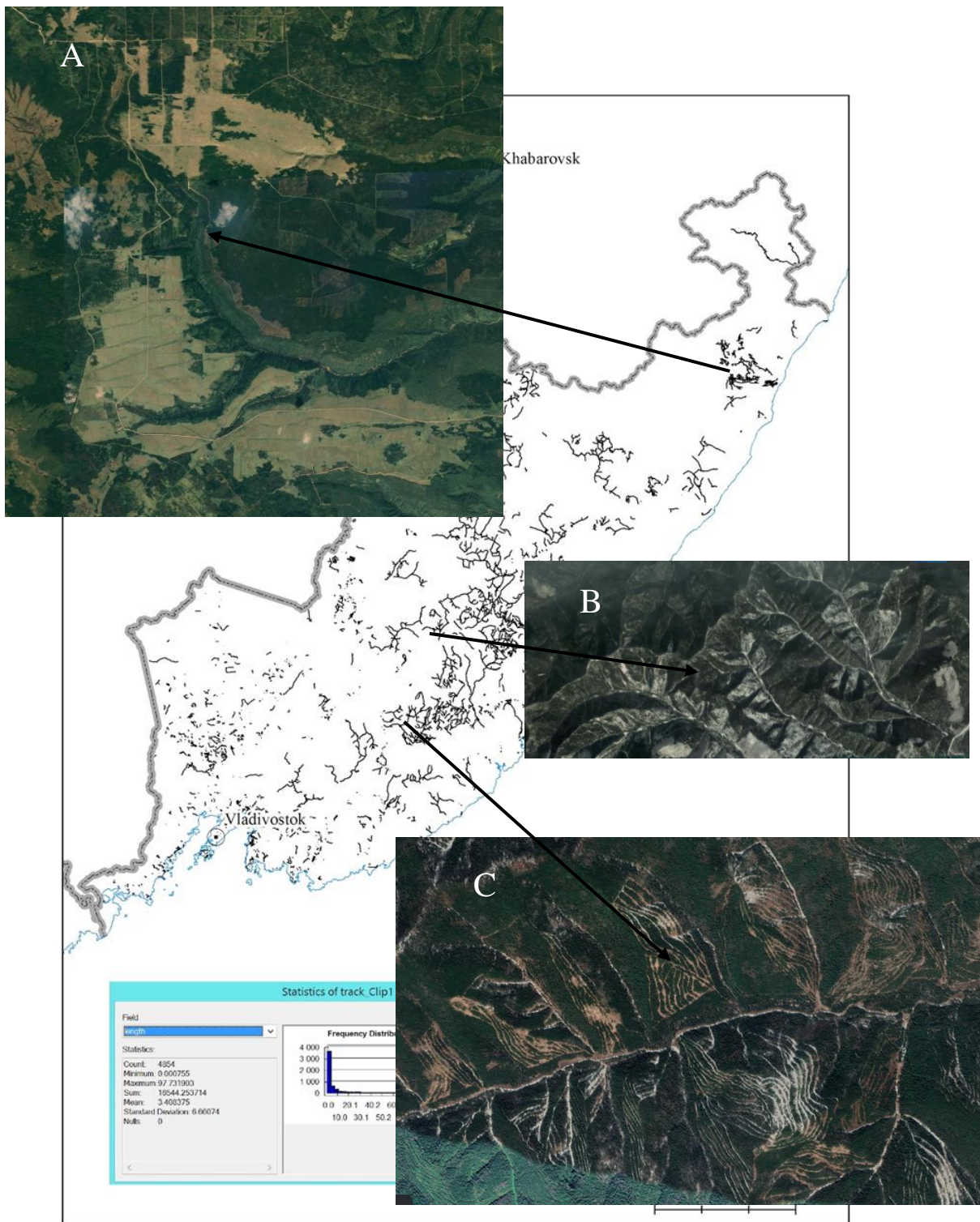
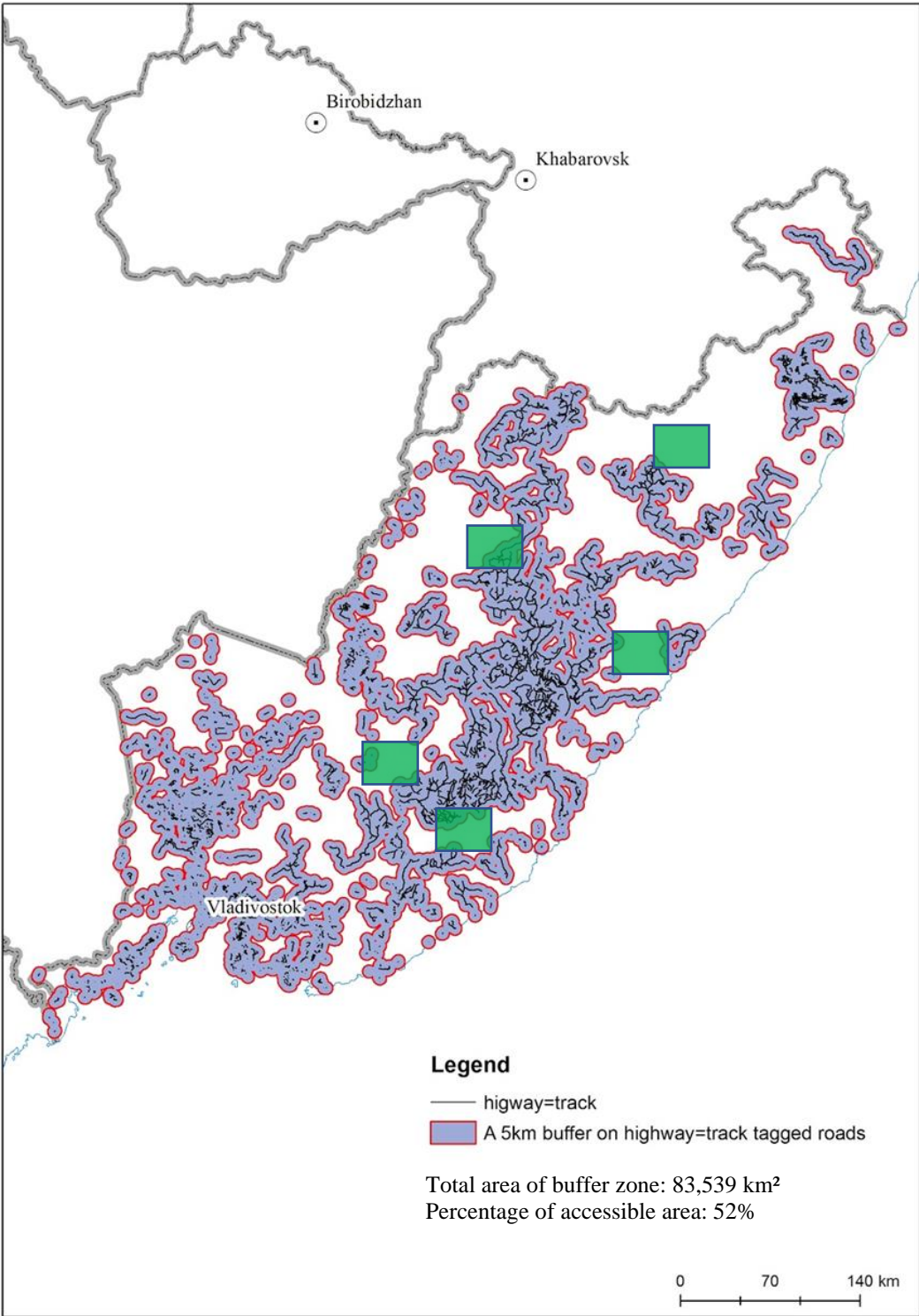


Figure 4.2 Addition of a 5km buffer zone to all the logging roads, which provides an accessibility level that hunters may have into the taiga (assuming a hunter can walk

10 km in one day). Approximately 52% of Primorye is accessible to hunters. The average tiger male territory of 2000 km² has been included in green squares to demonstrate impact of road network.



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